CRANFIELD UNIVERSITY

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The prospect of flooding and the motivation to prepare in contrasting urban communities: A qualitative exploration of Protection Motivation Theory

School of Applied Sciences

Doctorate (PhD)

Academic Year 2014

Supervisor

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September 2014

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This thesis is submitted in partial fulfilment of the requirements for the degree of PhD.

Abstract

The number of flood related disasters is predicted to increase with the changing climate. How cities mitigate and prepare for the potential flooding influences the scope and extent of damage, and diminishes the risk of an event turning into a disaster. Preparation or preparedness is, therefore, seen as an important component to flood resilience in cities. This research qualitatively explored the social phenomenon of why some prepare and others do not through the application of Protection Motivation Theory (PMT) in two flood-vulnerable areas of the cities of Hamburg and Dhaka: Wilhelmsburg and Badda (respectively). This exploration utilised semi-structured interviews to collect information on local communities' flood risk perceptions and flood preparedness. The findings showed that the motivation that the informants had was highly influenced by the amount of prior experience they had had with floods. Where this was high, informants demonstrated a protection motivation that was culturally innate. Theoretical findings provided in depth detail of the components of PMT, and its applicability within flood risk contexts.

Although, still further exploration of PMT as an assessment tool of preparedness behaviour in urban-flood-vulnerable communities is recommended, this study has found that it does explain the differences in flood preparedness behaviours in urban communities. In addition its links with both the social system and individual cognitive processes provides insight into the different factors and reasons that influence the preparedness behaviour of urban communities.

Acknowledgements

"***Our doubts are traitors, and make us lose the good we oft might win, by fearing to attempt***."

— William Shakespeare, *Measure for Measure*

In facing my fears and doubts, in undertaking my attempt I have been accompanied by many who have acted as guides and scaffolding in the development of my research, as mentors and support, as friends, as loved one, as encouragers and realists, and above all lights when the journey got too surreal and dark to see the end. To all I say a big thank you and send you heart felt gratitude.

To Prof Paul Jeffrey for supervising me through the ups and downs, and Dr Melanie Muro and Dr Paul Trawick for accompanying him at different points in the journey. Thank you for your experience, your drive, and your belief in me. To those invaluable friends I met during my time at Cranfield, my fellow travellers and brave souls Kristina Sodomkova, Rachel Norman, and Kate Jackson, you have been and continue to be a blessing and great source of encouragement and joy, and I wish you all the best as you to reach the end of this season in your lives and move onto new and exciting things.

It is with a huge sense of gratitude that I acknowledge the role my case study partners played in enabling this research to become a reality. Your support during my time in your cities was invaluable, and the time I spent with you so enjoyable and rememberable. Thank you for your directions, lifts, listening ears, and insightful inputs. In Hamburg the CORFU team from the TUHH (Technische Universität Hamburg-Harburg): Ms Natasa Manojlovic, Mr Stefan Kurzbuch, and Mr Gehad Ujeyl, for your assistance with finding informants, in providing somewhere to work and access to your resources, I am most appreciative. Thank you also to Mr Nico Schrage, Mr Suleman Shaikh, and Mr Vincent Gabalda for connecting me with informants from Wilhelmsburg. In Dhaka the team from the IWM (Institute of Water Modelling): Mr. David Mohammad Khan & Mr Imtiaz Taher for your input into my research process

and help with administrational hic-ups; Dr. Asif Zaman & Mr. Feroz Islam for your help with city maps and invaluable insights into your culture; and the IWM executive for taking me under your wing and giving me a desk and access to your resources, I thank you.

Those people who have worked beside me as I sought out and talked to informants in both case studies. Without you I would not have accomplished any part of this journey. You acted as my voice and enabled me to understand what was being said. You helped guide me through the streets of your cities, and gave your own local perspectives to what we were hearing and seeing - thank you: Kristina Gorkotte-Szameit for translation support while in Hamburg, and Mark Baidya, Naureen Mou, & Sabrina Saba Chowdhury for your translation and interpretation support while in Dhaka - all that you did has been invaluable to this journey. To Elisabeth Peters (Wilhelmsburg), Maxim Argho (Dhaka Bangli interviews) and Janna Patti (Dhaka English interviews) who all worked tirelessly to transcribe and translate hours of informant interviews in a most professional way I commend you and thank you.

A big thank you to Food for the Hungry for helping me get in touch with informants in Badda, for organising meetings, and providing valuable suggestions on how to approach interviews with informants in the poorer areas. A special thank you to John and Kate Marsden, and Tim Danz for your advice, support and direction.

At Operation Mobilisation Bangladesh, Phil and Jenny Bushell for providing guidance on the culture, introduction to new acquaintances and guides in getting around Dhaka, and for allowing me to tag along to Sirajganj so that I could talk to members of Bangladesh's rural communities, and learn a little about how they live with floods. Thank you very much for all the help you gave, it was very much appreciated.

Of course it goes without saying that there would be no study if not for the many informants, in both Hamburg and Dhaka, who gave me their time, sharing with me their perspectives of the flood situation in their cities, and experiences they have had. For aiding me in finding others who would participate, and going as

far as introducing me personally in some instances. A special acknowledgement is made of the effort and time Hosrnara gave in helping me find informants in the poorer-communities of Badda.

This research has been funded by the European Commission's Seventh Framework Project Programme CORFU, I want to express my gratitude for the opportunities you made happen. To Cranfield University and the Lorch Foundation for giving me a place to call home, and providing social, administrative and financial support.

To my family, who have believed in me through out, gave me their strength, somewhere to stay, provided a source of debate around certain topics, drove me around Wilhelmsburg, and loved me, thank you is not enough, but it is all I have. To my beloved Geoff, I cannot express how you have enabled me to get through this journey smiling, I am so grateful for your love and support.

With great humility I acknowledge that all would not have been possible without my Lord's grace and guidance. To Him who is King I give honour and glory.

Lastly, it remains to be said, that for all the support I have received, I acknowledge that I am responsible for any misinterpretation and errors which the reader may find.

Publications, Reports & Presentations

Publications

Birkholz, S.A., Muro, M., Jeffrey, P., & Smith, H.M., 2014: Rethinking the relationship between flood risk perception and flood management. *Science of the Total Environment*, 478, pp. 12-20.

Birkholz, S.A., 2013: Exploring protection motivation in Wilhelmsburg (Hamburg): is the risk 'real' to the people of the Elbe-Insel. *International Conference on Flood Resilience: experiences in Asia and Europe*, 5-7 September 2013, Exeter, United Kingdom.

Reports

Birkholz, S.A. & Jeffrey, P., 2013: Recommendations for strategies and mechanisms to enhance community preparedness and coping capacity in CORFU case studies (Hamburg & Dhaka): the ARL Framework. Unpublished report to the European Commission. CORFU FP7 Collaborative research on flood resilience in urban areas. Cranfield University. Cranfield.

Birkholz, S.A., 2013: Flood risk perceptions in CORFU case studies (Hamburg & Dhaka): determining protection motivation for the social dimension. Unpublished report to the European Commission. CORFU FP7 Collaborative research on flood resilience in urban areas. Cranfield University. Cranfield.

Birkholz, S.A. & Muro, M., 2011: Flood risk perceptions: a review of theory and practice. Unpublished report to the European Commission. CORFU FP7 Collaborative research on flood resilience in urban areas. Cranfield University. Cranfield.

Presentations

Birkholz, S.A., 2013. *The Social Dimension of Urban Flood Resilience*. Presentation to CORFU partners. Barcalona 16th April 2013.

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Chapter 1 Introduction & background

This chapter introduces the background of the research undertaken in this thesis; it specifies its research aims and objectives, as well as the contribution to knowledge it makes. The last section outlines the structure of this thesis and provides brief descriptions of each chapter.

1.1 Background to Research

Floods are the outcome of a combination of meteorological, hydrological and anthropological variables and extremes (WMO & GWP, 2008). Through out history floods have been affecting people and the environments in which they live. Floods are natural events, it is the impact they potentially have on human well-being that makes them natural hazards and potentially disasters (Ericksen, 1986). In recent years there has been a growing recognition that with climate change and global development activities, the incidence of flooding is on the increase (Schanze, 2006; Zevenbergen & Gersonius, 2007). The economic damages due to them range in the billions, and are increasing (jump from US$20bn to US$55bn between 2001 and 2002 alone) (Grothman & Reusswig, 2006). The technological measures utilized by the developed world are not sufficient in protecting communities at risk, and improved preparedness and response measures are required (Zevenbergen & Gersonius, 2007).

This recognition has lead to the questioning of the conventional flood management perspective of the developed world, which has taken a more technical, reductionist view on flood management. This questioning has resulted in the idea of '*living with floods*', as opposed to stopping them (Shen, 2010). The coping strategies (technological and social) and mitigation actions necessary for improving flood resilience within the management perspective of living with floods, requires an understanding of social variables such as flood risk perceptions and culture (Shen, 2010). Flood preparedness behaviour of vulnerable communities is variable and has led to the query of 'why some act to prepare and others do not?' (Grothman & Reusswig, 2006; Mankad et al., 2013).

1.1.1 Urban environments & Non-structural mitigation

The world is currently *"urbanizing rapidly*", unlike past decades more than half of the global population is now living in urban centres (IRFC, 2010, pp. 14). Cities are urban centres characterised by unique and diverse architectural structures, population concentrations, places of assembly, and interconnected infrastructure (Godschalk, 2003; Pelling, 2003). They are products of long processes of development and the effects of cities are being felt daily on the lives of those who live in the remotest rural areas (Clark, 1982). All of which makes cities highly desirable places to live and work; unfortunately the very things that create this desirability also make them areas highly vulnerable to natural [and technological] disasters (Godschalk, 2003; Pelling, 2003; IRFC, 2010). It is this vulnerability that has made cities the foci of much national and international research in both developed and developing nations (UN-Habitat, 2004; UN-Habitat, 2008; IRFC, 2010; Grünewald et al., 2011; UN-Habitat, 2012).

The threat of damages to property, enterprise and human life due to flooding, is intensified in urban centres, where there is a high concentration of society, infrastructure and economy (Pelling, 2003; IRFC, 2010). Societies that are exposed to flooding be it in developing or developed, rural or urban contexts have to establish strategies or actions (adaptions) for coping with or reducing the negative impacts of flooding (Kates, 1963; Few, 2003). One broad distinction or classification of these strategies is between 'structural' and 'non-structural' (Few, 2003).

Both within historical and contemporary settings, the developed world has relied heavily on structural, engineered, control strategies to modify the flood event itself (Burton et al., 1993; Haque, 2000). However, the limitations of structural defence are becoming more and more evident in the context of shifting economic situations and estimated increases in sea level and flood frequency (and potentially magnitude) due to climate change (Few, 2003; Smit & Wandel, 2006; Adikari et al., 2010). This has shifted focus onto the increasing need for private stakeholders to participate in their own protection and preparedness

(Terpstra & Gutteling, 2008). Preparedness measures undertaken by vulnerable communities and individuals have been found to diminish the extent of damage due to floods (Grothmann & Reusswig, 2006; Terpstra, 2009). Being 'prepared' is, therefore, seen to impact on damage potential.

The prospect of increased future-flood frequencies and intensities, increasing urban populations (in vulnerable areas e.g. coastal, riverine), increasing rates of urbanization (and associated flood risks e.g. water logging and pluvial flooding), and increased awareness of the limitation of flood preventative (structural) defences, all mean that many urban communities exist within a space increasingly vulnerable to the impacts (social and physical) of floods. Determining mechanisms for assessing and strengthening urban communities' capacities to act for themselves and protect themselves is not only important, it is more and more a necessity for the long-term protection of these communities.

1.1.2 Risk perceptions & motivation to prepare

The nature of the experience (i.e. time, frequency, extent of event/s, outcomes of event) individuals and communities have of flooding has a significant influence on their knowledge of the risks associated with it (Weinstein, 1989), and assessment of those risks in terms of preparing and protecting themselves from them (Lindell et al., 1997; Grothmann & Reusswig, 2006; Terpstra, 2009; Peters-Guarin et al., 2012). In areas where floods are not new to people, they will work out their own methods for protecting themselves and their livelihoods, (Twigg, 2004). However, in areas where floods are not a regular experience, the knowledge required to be able to prepare for and cope with them may also be lacking. The historic reliance on structural defences has created the situation in many areas where the abatement of floodwaters has also reduced the coping knowledge of vulnerable communities. Slovic et al. (1981) describes how with the lack of direct experience, people's perception of risk is left open to the judgement bias generated through media, perceived sense of personal immunity, and personal complacency. Such bias in turn results in a lack of motivation to prepare. Even with the resources available and the skills at hand to use those resources to implement coping mechanisms that can reduce the

risks posed by a potential flood event, without the motivation to act a social system will not be prepared to withstand a flood, and their vulnerability to such an event greatly enhanced. The question of what influences peoples' motivation to act and prepare in the face of a potential threat be it from nature or technology is one that has been present and investigated for several decades (White, 1945; Starr, 1969; Fischhoff et al., 1978; Douglas & Wildavsky, 1982; Tversky & Kahneman, 1982; Kasperson et al., 1988; Burton et al., 1993; Slovic, 2000; Terpstra, 2009).

Risk communication is considered to be the principal factor influencing and/or initiating protective-action decision making within communities that do not experience frequent flooding (Terpstra, 2009). Why people do not heed risk messages or become motivated to take protective actions has been found to be linked to how people perceive the risk to start with (Slovic, 2000). Human assessment of risk related to a hazard is assumed to result in a choice (rational or otherwise), and/or weighting of the risk, that dictates the range of responses or adjustments that can be made or taken to reduce the potential impact of the negative aspects of a hazard (White, 1945; Slovic et al., 1974; Kates & Kasperson, 1983; Burton et al., 1993). Risk assessment in turn is a component of a larger hazard or risk management framework (Kate & Kasperson, 1983), which incorporates decisions and actions required to mitigate risk that may exist above structured protection options and innate coping capacity (Schanze, 2006). The intuitive risk judgments, which most people utilise to assess the potential impacts and consequences of a hazard, are commonly referred to as risk perceptions (Slovic, 1987).

Although, the use of risk perceptions within natural hazard management has received much attention over the decades (White, 1945; Slovic et al., 1974; Kates & Kasperson, 1983; Burton et al., 1993), only tentative links and relationships have been found in the relationship between risk perception and conation[1] (Bubeck et al., 2012). However, the research into risk perceptions

[1] The mental faculty of purpose, desire or will to perform an action.

and their relationship to adaptation has identified many mediating factors. Determining how these factors mediate and work to influence adoption of preparedness measures has been a chief objective of behaviouralists the world over (Mulilis & Lippa, 1990; Grothmann & Patt, 2003; Martin et al., 2007; Mankad et al., 2013). A variety of theories concerning human decision-making and behaviour under conditions of risk and uncertainty can be found in the spheres of clinical psychology, health education and health risk communication studies (Bočkarjova et al., 2009). These include: the Theory of Reasoned Action (TRA), Person-relative-to-event model (PrE), and Protective Action Decision Model (PADM). These theories provide means by which risk perception and action can be connected and investigated.

Unfortunately within the context of natural hazard literature, there exists a paucity of studies involving the investigation of risk perception and behaviour motivation (Bočkarjova et al., 2009). In the context of flood preparedness and adaptation, Grothmann and Reusswig's (2006) utilised Protection Motivation Theory (PMT) to assess the pathway between perception of flood risk (threat appraisal), assessment of response options (coping appraisal) and adoption of flood protective (preparedness) measures in the city of Cologne (Germany).

The use of PMT has been largely confined to research regarding motivation to protect around health issues (Norman et al., 2005). Only a few studies have been done utilising PMT to assess the motivation flood-vulnerable residents have to prepare for future floods (Grothmann and Reusswig, 2006; Bočkarjova et al., 2009; Zaalberg et al., 2009). These studies have been quantitative and confined to developed nations (Germany and the Netherlands), with low probability high consequence events. There is, therefore, a need to expand our understanding of the social phenomenon of why some prepare for future floods and others do not in both low probability and high probability contexts, and further the investigation of the usefulness of PMT as a theory that provides a means to connect flood risk perceptions with coping adaptations.

1.1.3 The relationship between this thesis and the CORFU project

CORFU (Collaborative Research on Flood Resilience in Urban areas) is a European Commission's Seventh Framework project interested in improving methods for the assessment and enhancement of urban flood resilience. It involved several Asian and European partners, and nine case cities (Hamburg, Nice, Barcelona, Mumbai, Dhaka, Beijing, Seoul, Taipai). The main interest of the project was the development of models (e.g. urban growth, flood, flood damage, resilience indices) to aid city authorities in the assessment of flood resilience, and suggest means by which it might be improved. Cranfield University's and the Author's focus within this endeavour was to investigate the flood risk perceptions of residents within the case study cities to provide indication of the behavioural characteristics of these residents. As such:

- The research presented in this thesis has been funded by the EC and CORFU initiative.
- Fieldwork done for this thesis provided data for the Author's contributions to the CORFU project.
- The selection of case sites was limited to the CORFU case cities.

However, the aim and objectives of this thesis are independent of the CORFU project, and its outcomes and most of its findings have not been utilized within the CORFU deliverables. Similarly several outputs produced for the CORFU project have not been utilized in this thesis.

1.2 Research Aim & Questions

The aim of this thesis is to 'increase understanding of urban citizen's flood preparedness behaviour, or lack of it, through the qualitative application of Protection Motivation Theory (PMT) in two culturally, economically and physically contrasting urban communities (Wilhelmsburg, Hamburg and Badda, Dhaka)'. This aim focuses on a social phenomenon and question currently perplexing the global community of flood risk managers, planners, researchers, and aid organisers, namely: 'why do residents of urban communities take or not take precautions against potential future floods?' In order to address this aim this research asks:

1. How are sources of information (SOI) on flood risk affecting how these urban communities describe floods and what worries them about flooding?
2. How do these communities perceive their flood risk and their ability to cope with it?
3. Can PMT and its compositional concepts, namely SOI, threat appraisal, coping appraisal, and responses, be used to explain differences in preparedness behaviours in urban communities at risk of future floods?

Although this study places itself within the context of flooding in urban environments it does not:

- Attempt to define a city.
- Explore, identify or attempt to describe the social dynamics, culture or geography (etc.) of urban communities, other than in regards to flood risk perception and preparedness behaviour.
- Explore, explain or determine physical dynamics of flooding.
- Identify or describe possible mitigation strategies against flooding in the case sites or in general.
- Explore or elaborate on the concepts of vulnerability and resilience within this context - other than through:
    - The research finding's indirect contribution to the assessment and improvement of the case sites' social vulnerability and resilience – and urban environments in general.

  - The provision of potential characteristics of vulnerable and resilient urban communities as identified from analysis and conclusions.
- Undertake a [flood] vulnerability assessment of the urban communities explored.
- Seek to discuss, define, or elaborate on Flood Risk Management (FRM) or Disaster Risk Reduction (DRR) – other than through this research's application to:
  - The assessment and improvement of the case sites' social vulnerability and resilience as might emerge from the findings and discussion.
  - The improvement of risk communication endeavours within the case sites and in general.

1.3 Research Contribution

The main contributions of knowledge offered by this research are:

The undertaking of the first qualitative use of PMT to explore protection motivation in regards to flood preparedness. PMT is considered to be a potentially useful approach in assessing people's motivation to prepare, and this study elaborates on it through a qualitative exploration of its components in flood-risk contexts. Entrenched within this contribution are two avenues of elaboration.

The first involves the theoretical contribution to PMT through its use in a qualitative research context. This serves to provide more contextual and in-depth assessment of the theory's components and processes, than is offered by quantitative assessment alone. Only one other study (Searle et al., 2000) could be found that qualitatively applied PMT to eye-patching behaviour in children diagnosed with Amblyopia, as such this study contributes to the paucity of research involving the qualitative assessment, application or use of PMT in researching protective behaviours.

The second point of elaboration involves the application of PMT in the assessment of flood protection motivation, most research involving PMT has been based within the health sciences and only a few studies (Grothmann and

Reusswig, 2006; Bočkarjova et al., 2009; Zaalberg et al., 2009) have utilised the theory in the context of flood preparedness and protection motivation. As such this study contributes to this somewhat scarce area of investigation.

The broadening of understanding around the social phenomenon of why some prepare for future floods and other do not in urban contexts, through the exploration of the components of PMT in both a developed and developing, low and high probability urban case sites. As awareness around future climatic conditions broadens, and research suggests more and more that the risk natural hazards such as flooding pose to communities grow, there is a increasing need for better understanding around what is influencing some to prepare and others not. This study contributes by providing additional, previously unexplored case studies around the flood preparedness behaviours and perceptions of urban communities. In this regard several somewhat novel contexts are investigated in this study.

The first context is the urban environment, although research into urban environments and more specifically urban communities has a diverse history and research tradition, it has only been in the last two decades that understanding of their vulnerability (ever increasing under the pressures of population growth and rapid urbanization) to floods has become of significance. As such research with urban communities and environments concerning flood preparedness is of importance in the endeavour to reduce the risk of flood disasters in these environments.

The second context involves the application of PMT in a developing context with a high-flood frequency (high probability, high consequences). No research could be found that looked at the application of PMT in exploring, describing, and/or assessing communities in developing contexts. Similarly, no research could be found that looked at PMT in communities living with a high probability of flooding. Such research provides an important point of comparison and/or contrast for other contexts and studies, and also more fully looks at the significance of experience in influencing protection motivation and cognitive perception processes.

1.4 Thesis Structure

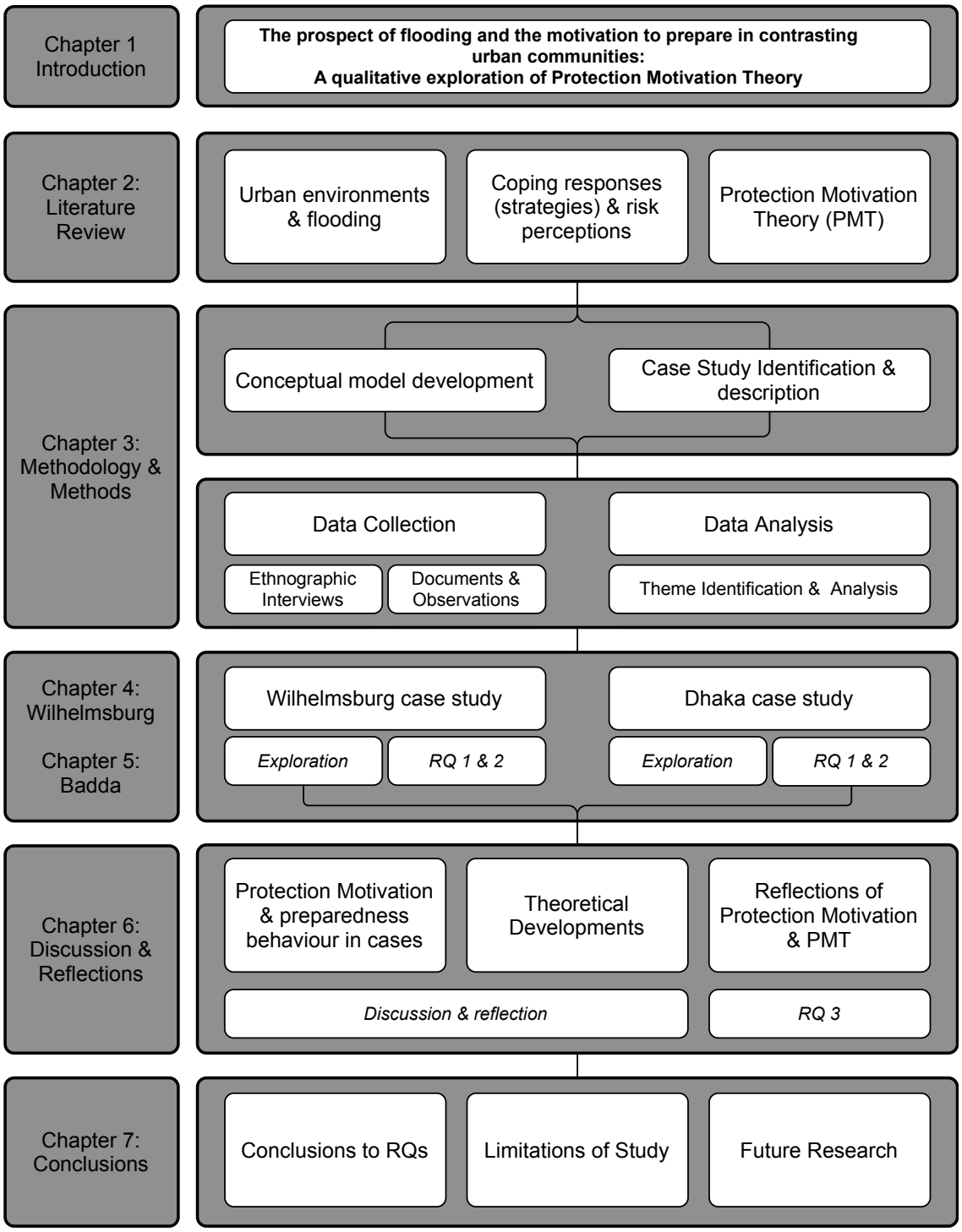


Figure 1.1 Thesis structure; RQ = Research Questions

Figure 1.1 present the diagrammatical breakdown of this thesis and its seven chapters:

Chapter 1 presents the introduction and background to this study. As well the main research aim and questions, its contribution and structure.

Chapter 2 looks at the literature around: coping responses, risk perceptions and Protection Motivation Theory.

Chapter 3 describes the methodology adopted and adapted for this research. This is an explorative, qualitative case study that frames itself within a pragmatic research philosophy, and employs inductive logic with aspects of abduction in addressing its research aim and question. It utilises a conceptual framework based on Protection Motivation Theory (PMT) to guide and direct the exploration of the [flood] sources of information (SOI), risk perceptions and preparedness behaviour of urban communities in Wilhelmsburg (Hamburg) and Badda (Dhaka). Data collection involved the use of ethnographic interviews, observations and case documents. Data analysis was undertaken by applying thematic analysis to the coded interview transcripts and key themes and categories identified and refined.

Chapter 4 presents the explorative findings of the conceptual processes of PMT (i.e. SOI, threat appraisal, coping appraisal, and protective and non-protective responses) as they are identifiable in the cases in Wilhelmburg, Hamburg.

Chapter 5 presents the explorative findings of the conceptual processes of PMT (i.e. SOI, threat appraisal, coping appraisal, and protective and non-protective responses) as they are identifiable in the cases in Badda, Dhaka.

Chapter 6 involves three discussion points. The first looks at the protection motivation and preparedness behaviour in the cases. The second discusses the theoretical findings and implications of the study. Lastly the third reflects on the concept of protection motivation and the usefulness of PMT for investigating the flood preparedness behaviours of urban communities.

Chapter 7 is the thesis conclusion, and wraps up the thesis with a look at the limiting factors of this study, and the potentials for further research.

Chapter 2 Coping, Risk Perceptions and Protection Motivation: how and why some prepare and others do not.

This literature review looks at the literature and understanding around preparedness behaviour. Section 2.1 presents a discussion on urban environments and their communities' vulnerability to flooding. Section 2.2 discusses three points relating to preparedness behaviour:

1. The responses themselves and the understanding of what coping is.
2. The knowledge and ability people need in order to know when and how to employ responses.
3. The cognitive factors, principally risk perceptions, which are understood to be involved in how people make decisions around responding and the importance of responding.

Lastly, Section 2.3 looks at Protection Motivation Theory, and how the cognitive aspects (risk perceptions) act in mediating the conative aspects (coping responses), i.e. influence why some take action and others do not.

Literature concerning flood risk has been the focus of this review, however, to more fully understand them, exploration is often extended to other risks (specifically risks associated with living in areas prone to natural hazards, e.g. earthquakes, droughts, volcanoes) and at times anthropogenic hazards (e.g. crime and violence, nuclear power). The core context for this review has been flood risk to urban communities.

2.1 Urban environments, communities & vulnerability to natural hazards

The 1990s were the UN's International Decade for Natural Disaster Reduction (IDNDR) (Askew, 1997). They were planned to represent an international effort that could be considered "*a potent first step in reducing the impacts of natural hazards through coordinated research, data gathering, and information sharing*." (National Academy of Sciences, 1987 cited in Askew, 1997, pp. 4). An interesting philosophical shift to take place during this time was the growing

acceptance of sociological perspectives of disasters, in which the view is that these events are largely socially constructed and that culpability for them lies in the societies affected by them (White et al., 2001). Traditionally, the geographical perspectives had been on hazards within human-environment systems and the focus on the range of adjustments that can be made to improve social security within them, however, as the view shifted towards the perspective that there is no such thing as a 'natural' disaster only natural hazards, the focus has shifted to reducing the risk of disaster from hazards.

The link between urbanization and the increasing vulnerability of urban communities to natural hazards is another aspect of interest to arise from the IDNDR (Pelling, 2003; Wisner et al., 2004). Cities are the creation of human ingenuity and vision; as such they represent complex and interdependent systems in which points of vulnerability are everywhere (Godschalk, 2003). Infrastructure, buildings, telecommunications, transport and resource supply lines all represents essential components of urban environments, and points vulnerable to natural hazards (Moor, 2001). What's more disaster risk in urban environments is constantly being redefined with shifts in urban landscapes and new socio-economic concerns and influences (Pelling, 2003). In effect "*Urbanization affects disasters just as profoundly as disasters can affect urbanization*" (Pelling, 2003, pp. 7). In addition, urban environments paradoxically create situations in which development does not only reduce the vulnerability of people to natural hazards, but often unwittingly creates new forms of vulnerability (Benson et al., 2007). Indeed it has become widely accepted that disasters are the results of unmanaged risks within the development process; they are created where natural hazards occur where people, assets and systems are exposed and susceptible to their impacts (Turnbull et al., 2013).

It is now estimated that over half of the world's population lives in urban centres (IRFC, 2010; Dodman et al., 2012). What's more the UN's Population Division is reported as suggesting that in the next few decades almost all of the world's population growth will be in urban centres (IRFC, 2010). These urban centres

are very often situated in areas at risk from extreme weather events (e.g. hurricanes, tornadoes, droughts) and storm surges (IRFC, 2010). Many of these events and storm surges are estimated to increase in frequency and intensity with climate change and sea level shifts, as such the risks to vulnerable cities is predicted to escalate (Schanze, 2006; Zevenbergen & Gersonius, 2007; IRFC, 2010). A worrying characteristic of urban populations is the high inequality that exists; with it not being uncommon to find that up to half of the people living in the world's urban centres live in informal settlements with poor service provision and social conditions (Dodman et al., 2012). Indeed urban-poor (low-income) communities are largely acknowledged among those being most at risk in urban environments (Dodman et al., 2012).

Flood risk in densely populated areas is a topic whose research legacy stretches back to human settlements themselves (WMO/GWP, 2008). With the settlement locations being historically tied to the search for transport routes, water provisions and aesthetics riverbanks, lakesides and coastal areas have long been preferred. Such sites carry innate flood risks from fluvial and ocean sources. With time, however, cities have grown and complicated their vulnerability to flooding, the creation of large impervious areas through which rain water and wastewater cannot infiltrate into the ground, creates large run-off that drainage networks very often can not accommodate (WMO/GWP, 2008). Within urban societies additional social elements play out that also contribute to the vulnerability of these cities. Aspects such as global changes, migration patterns (within a city, between a city and the country, and between the city and the other countries) (Adikari et al., 2010), local environment resource use, governance practices (Aragón-Durand, 2007), development practices (Fleischhauer, 2008; Adedeji et al., 2012) and disaster management practices (WMO/GWP, 2008) all impact on the vulnerability of urban communities to flooding. Therefore, floods can be considered the outcome of a combination of meteorological, hydrological and anthropological variables and extremes (WMO/GWP, 2008). However, technological measures utilized by the developed world are not sufficient in protecting communities at risk, and improved preparedness and response measures are required (Zevenbergen &

Gersonius, 2007). This recognition has lead to the questioning of conventional flood management perspective of the developed world, which has taken a more technical, reductionist view on flood management. This questioning has resulted in the idea of '*living with floods*', as opposed to stopping them (Shen, 2010). The coping strategies (technological and social) and mitigation actions necessary for improving vulnerability to flooding in urban areas, within the management perspective of living with floods, requires an understanding of social variables such as flood risk perceptions (Shen, 2010) and coping responses (Bubeck et al., 2012).

The concept of vulnerability has had many definitions, and has a rich multi-disciplinary tradition in risk, hazards and disaster research (Cutter et al., 2009). Broadly defined as '*the potential for loss*' (DHA, 1992; Cutter, 1996), and more conceptually defined as '*the susceptibility of a given population, system, or place to harm from exposure to the hazard and directly affects the ability to prepare for, respond to, and recover from hazards and disasters*'[2] (Cutter et al., 2009, pp. 2). Vulnerability is considered to involve three elements: exposure to hazard (i.e. proximity to source to the source of threat, incident frequency and/or probability, magnitude, duration), susceptibility (i.e. how liable is the community to being influenced by the hazard), and adaptive capacity (ability to resist and be resilient) (Few, 2003; Messner & Meyer, 2005; Adger, 2006; Birkmann, 2006; Grothmann & Reusswig, 2006; Smit & Wandel, 2006; de Bruijn et al., 2007; Lopez-marrero, 2010).

Social vulnerability is focused on who is at risk and to what degree they can be harmed, Cutter et al., (2009, pp. 2) defines this as the explicit focus on '*those demographic and socioeconomic factors that increase or attenuate the impacts of hazard events on local populations'*. The concept of social vulnerability provides a means of including the factors that add to or reduce the people-at-risk's capacity to respond to natural hazards; as such it plays an important role

[2] Definition adopted in this study.

in including a social dimension to risk impact assessment (Schneiderbauer & Ehrlich, 2004).

The social vulnerability of urban communities to flooding is an increasingly important topic in research and management endeavours. It reflects the extent to which vulnerable communities have to resist and respond to the flood risks they face. In this regard, understanding what affects people and urban communities' motivation and capacity to take action and cope is essential.

2.2 Coping responses & risk perceptions

In understanding people's views of disasters and their choices of responses to them, there are two distinct avenues of research that have arisen since the early 1900s. On the one side Gilbert White (1945) was interested in the 'adjustments' people make to live in floodplains in the US. On the other psychologists like Paul Slovic (2000) were interested in people's perceptions of the risk they face. Although, ultimately both fields of interest intersected (Slovic et al., 1974; Kates, 1976) and diversified to include sociological thought concerning the social construction of risk (Slovic 2010), their ideas laid the foundations for most disaster preparedness and perception research since.

Review of the literature associated with these different avenues of research highlight three views concerning disaster responses these are:

1. The actual actions and responses people employ to protect themselves from the impacts of natural hazards.
2. The knowledge required to utilize these actions to best protect one self.
3. The perceptions of risks that are believed to encourage these responses to be employed.

2.2.1 Flood [disaster] response actions

Response actions are those activities, behaviour or arrangements that people undertake in order to cope with stressful or hazardous events or situations. The concept of 'coping' has been investigated in a diverse range of social disciplines (e.g. sociology, anthropology, and psychology). Coping is defined by Carver &

Connor-smith (2010, pp. 685) as the *"effort to prevent or diminish threat, harm, and loss, or to reduce associated distress"*. Essentially, 'coping' reflects psychological, behavioural and cultural mechanisms for dealing with 'stress'[3] (Thoits, 1995; Skinner et al., 2003; Carver & Connor-smith, 2010). Although the ways in which people cope with stress are not fully known or understood, it is generally accepted that the ways in which people deal with stress can reduce or amplify the effects of adverse life events and conditions (Skinner et al., 2003; Wisner et el., 2004). This has been found to be the case for not only short-term emotional distress and functioning, but also long-term development of physical and mental health and/or disorders (Thoits, 1995; Skinner et al., 2003). As coping thresholds are overtaxed and an individual's physical and psychological resources are depleted, there is an increasing probability of illness, injury, or disease, or that psychological distress or disorder will follow (Thoits, 1995).

Table 2.1 presents different types of coping responses that people employ to deal with stress (Carver & Connor-smith, 2010). In European Cities (areas) at risk of flooding, dependence and trust (reliance) in the state to protect against floods has limited the extent current (generational) social units believe they need to invest in personally preparing for a potential flood (Grothmann & Reusswig, 2006; Terpstra, 2009). This could be seen as a disengaged-coping response or meaning-focused response (e.g. 'some higher power will take care of us', 'we trust that the city authorities have good plans in place to protect us') (Table 2.1) on the part of residents. Such disengaged coping results the social unit[4] not dealing with the threat or stressor 'head-on', instead they do so by trying to escape it through denial (e.g. there is no risk of flooding here) or avoidance (e.g. there is no risk of flooding here at the moment) and/or even wishful thinking (e.g. we have had one big flood here in the last ten years there wont be another in our lifetime) (Burningham et al., 2008). Given these different

[3] *"The experience of encountering or anticipating adversity in one's goal-related efforts" (*Carver & Connor-smith, 2010, pp. 684), and occurs "*when people confront situations that tax or exceed their ability to manage them*" (Lazarus, 1966 cited in Carver & Connor-smith, 2010, pp. 684).
[4] Individual, household, community, and/or organization.

types of coping, it's interesting to point out that lack of preparedness behaviour does not mean a lack of responses – only a lack of protective responses.

Table 2.1 Different classifications for individual psychological ways of coping.

Coping Type	Description of coping type
Problem-focused coping	Is directed at the stressor itself and involves taking steps to remove it, evade it, or to diminish its impacts (if it cannot be evaded).
Emotion-focused coping	Is aimed at minimizing distress triggered by stressors, e.g. through self-soothing (relaxation, seeking emotional support), expression of negative emotion (e.g. yelling, crying), focusing on a negative thought/s (e.g. rumination), attempts to escape stressful situations (e.g. avoidance, denial, wishful thinking).
Engagement coping (approach coping)	• Is aimed at dealing with the stressor or related emotions. • It includes problem-focused coping and some forms of emotion-focused coping e.g. support seeking, emotion regulation, acceptance and cognitive restructuring. • Can be divided into attempts to control the stressor itself (primary-control coping) & attempts to adapt or adjust to the stressor (accommodative or secondary-control coping).
Disengagement coping (avoidance coping)	• Is aimed at escaping the threat or related emotions. • Includes responses such as: avoidance, denial and wishful thinking. • This type of coping is most often emotion-focused as it involves attempts to escape feelings of distress. • It can be an effort to literally act as though the stressor does not exist so that it does not have to be reacted to, behaviourally or emotionally. • Usually ineffective in the long term, as it does nothing to change the cause of the stressor's (i.e. a threat, harm or loss) existence.
Accommodative coping	• Refers to adjustments within the self that are made in response to constraints. • It includes responses such as: acceptance, cognitive restructuring, and scaling back one's goals in the face of insurmountable interference, and self-distraction (engagement with positive activities is a means of adapting to uncontrollable events).
Meaning-focused coping	• People draw on their beliefs and values to find, or remind themselves of, benefits in stressful experiences. • This type of coping may include reordering life priorities and infusing ordinary events with positive meaning. • People try to find benefit and meaning in adversity. • Involves reappraisal and appears to be most likely when stressful experiences are uncontrollable or are going badly.
Proactive coping	• Includes strategies to prevent threatening or harmful situations from arising. • Nearly always problem-focused. • Involves the accumulation of resources that will be useful if a threat arises and scanning the experiential horizon for signs that a threat may be building.

(Source: Carver & Connor-smith, 2010)

One broad distinction or classification of protective responses to flooding is between 'structural' and 'non-structural' (Few, 2003). Structural strategies usually refer to physical, engineered interventions such as: river channel

modifications, embankments, reservoirs and barrages and modified drainage systems (White, 1945). Interventions designed to halt and/or abate the flow of water and control the spread of flooding (Few, 2003). In urban environments these are usually constructed and maintained by public agencies and represent precautionary or preparedness responses. Private flood protective responses include: the installation of protective water barriers, structural changes to the home, or rearranging of furniture (Grothmann & Reusswig's, 2006).

Non-structural measures are typically designed not to prevent floods, but to reduce the short and long-term impacts of the hazard (Few, 2003). These forms of risk reduction measures can be implemented through formal governance and policy systems. Examples include: flood insurance, relief aid, land-use zoning, evacuation, effective and timely flood forecasting & warning systems (Mileti, 1995; Drabek, 1999), agricultural adaptations (Churchill & Hutchinson, 1984; Paul, 1997), preparedness (having multi-story houses, having valuable things and essential utilizes, e.g. electricity, water, located in upper levels, etc.) and awareness programs (Few, 2003).

Burton et al. (1993) identify three groups of responses to natural hazards: biological adaptations, cultural adaptations and adjustments. Biological adaptations represent actual anatomical or physiological adaptations people might develop to better resist the impacts of natural hazards e.g. resistance to diseases or nutritional limitations (Burton et al., 1993). Cultural adaptations are those responses that local or indigenous knowledge has facilitated the development of, and that allow local populations and people to be sensitive to environmental feedback (Berkes & Folkes, 1998). Such adaptations may require specialised knowledge in order to access and utilise selected resources, and this can disappear with disuse or become useless through rapid change (Wisner et al., 2004). Adjustments represent those, often ordinary, activities that enable societies to adapt their adaptations if and as environmental conditions shift or change (Burton et al., 1993). These actions taken either intentionally or unintentionally have the effect of reducing risk from extreme events (Burton et al., 1993). Their adoption may be short-lived (once-off

responses) or become a part of the cultural capital of a society over time (Burton et al., 1993).

In communities where floods represent a frequent obstacle cultural adaptations and adjustments are prevalent and instrumental in the development of coping responses. Twigg (2004) classifies coping responses from these contexts into four broad categories: economic/material, technological, social/organisation, and cultural (Table A.4, Appendix A). Examples of coping responses utilised by urban communities in developing Asian contexts in regards to flooding are provided in Appendix A (Section A.1.1). These examples help highlight the diversity of protective responses that these cultures and communities have had to develop given the risks they face from frequent floods. However, these responses are only truly effective relative to people's ability and knowledge of how and when to utilize these responses.

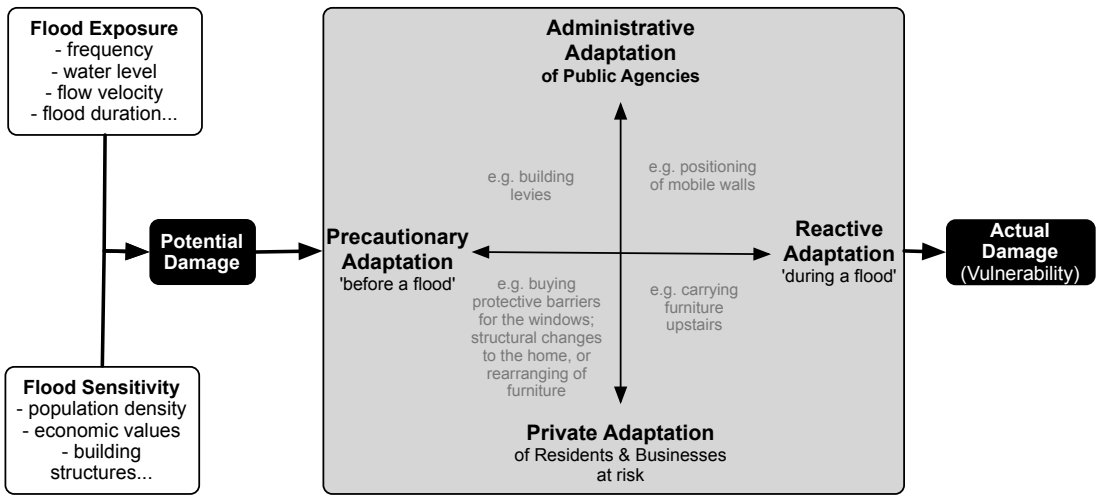
2.2.2 Flood [disaster] response strategies – knowing when & how to act

'Coping' and understanding the different responses people take to cope with stress or a hazardous event cannot be seen as a specific behaviour (Skinner et al., 2003; Twigg, 2004; Scheuer, et al., 2011; Peter-Guarin et al., 2012). Instead the concept of coping must be seen as an organisational construct, which encompasses the myriad actions individuals use to deal with stressful experiences (Skinner et al., 2003) as well as the knowledge and ability they need to employ these responses in the right way at the right time (Twigg, 2004; Wisner et al., 2004; Villagran de Leon, 2006; Peter-Guarin et al., 2012). This has been observed in the differences in responses to slow-onset, prolonged disasters like droughts (where coping responses and resources are most often used up by the time outside aid arrives), and rapid-onset disasters like floods (Twiggs, 2004).

The works of Gilbert White and his associates at the University of Chicago (and later the University of Colorado) approached flooding from the perspective of human ecology (Burton et al., 1968; Kates, 1971), in which the focus is on the interactions between humans and their environments (White, 1945; Kates,

1971). They identified that in selecting to live in an environment that is prone to natural hazards such as: hurricanes, drought, flooding, earthquakes, volcanoes etc., it is necessary for people to make 'adjustments' to their lifestyles and activities in order to persist in those environments (Kates, 1971; Kates, 1976). Essentially when faced with the uncertainty presented by floods, people have two choices: 1. People must develop the ability to weather the storm and suffer the losses associated; or 2. Take steps in advance to avoid or reduce associated damages (Kates, 1963). Both choices involve the ability and knowledge people have of their risk and the best ways to respond to it pre, during and post event.

Grothmann & Reusswig's (2006) go further and not only consider 'adaptation' to describe the ability, capacity or action of the people affected to avoid some of the potential damage of a flood, but that these adaptations have both social and temporal characteristics. These authors identify four types of adaptions within social systems in the preparation of flood events: 'administrative and *private* adaptions, and *reactive* and *precautionary* adaptations. The first two adaptations (i.e. administrative vs. private) introduce the need to consider the social hierarchy or scale of possible adaptations, and the latter two the temporal scale (i.e. precautionary vs. reactive) (Figure 2.1).



(Source: Adapted from Grothmann & Reusswig, 2006)

Figure 2.1 Influence of adaptation on potential and actual flood damage.

'Coping strategies' represent the successful use of indigenous knowledge in the development of a set of risk reducing survival skills and technologies

(Twigg, 2004). These strategies help guide the choices around the employment of actions and resources needed to deal with floods and other natural hazards. These choices are influenced by the nature of the hazard, the capacities available to deal with it, and to community and individual priorities – which can change themselves throughout the course of a disaster (Twigg, 2004; Scheuer, et al., 2011; Peter-Guarin et al., 2012).

Wisner et al. (2004) classifies coping strategies based on timing relative to a hazardous event i.e. pre-, during and post. Here 'coping strategies' are seen *'as the manner in which people act within the limits of existing resources*[5] *and range of expectations to achieve various ends'* (Wisner et al., 2004, pp. 113). For the most part, coping strategies work under the assumption that events will follow a familiar pattern, and in of this people's previous or earlier actions will be an effective guide in similar events (Wisner et al., 2004). The assumption under which people function is that sooner or later a particular risk will occur to which people will have some experience of how to cope (Wisner et al., 2004). Therefore, all adverse events perceived to have precedents, will have coping strategies that occur or are implemented before, during and after the event (Wisner et al., 2004).

Peters-Guarin et al.'s (2012) looked at poor-urban communities in two boroughs in Naga City (Philippines) and investigated the perceptions of 'manageability' these communities have in regard to flooding. What they found was that manageability of flooding was determined relative not just to physical aspects such as depth, duration and velocity of the water, but also from understanding and knowledge at the community level, which included awareness afforded through community-based warning systems and available household coping strategies (Peter-Guarin et al., 2012). Essentially all these elements helped these communities determine the range of options available to its members and households, for managing the flood threat (Peter-Guarin et al., 2012). 'Manageability' was defined by these authors as *"the way in which local*

[5] 'Resources' defined as *'the physical and social means of gaining a livelihood and access to safety'* (Wisner et al., 2004, pp. 113).

communities and individuals experience flooding and recognise the hazard posed, in relation to their capacity to handle the situation depending on their resources and range of coping mechanisms" (Peter-Guarin et al., 2012, pp. 5). This capacity is described by these researchers as having accumulated over generations from peoples' experiences and coping instances with flooding. Essentially most of this capacity has had to develop due to limited assistance from higher governance and authority structures (Peter-Guarin et al., 2012).

2.2.3 Perceiving the need to adapt: risk perceptions

The use of risk perceptions within natural hazard management has received much attention over the decades (White, 1945; Slovic et al., 1974; Kates & Kasperson, 1983; Burton et al., 1993). The attention this concept has received is due in part to the understanding that the risk perceptions individuals hold influence the decisions and actions they take in relation to minimising a perceived risk. Risk perceptions are defined as the subjective risk assessments or judgments that people make in response to a threat or risk-based situation or object (Slovic, 2000).

Uncertainty, in our daily lives, essentially provides the context in which we make judgments regarding outcomes and impacts of risks (Tversky & Kahneman, 1982). These judgements and/or perceptions are believed to influence the choices people make in responding to risks. It is this relationship between risk perception and potential response (action/behaviour) that makes the concept of risk perceptions appealing to hazard management (technical and natural). Research themes involving risk perceptions includes: the divergence in lay and expert risk perceptions (White, 1945; Kates, 1963; Boholm, 1998; Slovic, 2000; De Marchi, 2007); the assessment of risk acceptability by people (lay and expert) (Douglas & Wildavsky, 1982; Douglas, 1985; Starr, 1972; Fischhoff et al., 1978; Slovic et al., 1979); the objective (and quantitative) assessment of risk perceptions (Fischhoff et al., 1978); the factors affecting the relationship between risk perception and behavioural responses (Slovic et al., 1974); and the debate between rationalist behavioural perspectives and socially constructivist perspectives.

Rationalist approaches to risk perception assume a priori knowledge of risk and, therefore, rational behavioural decisions in regards to the perception of it. These approaches include: Chauncey Starr's 1969, paper on revealed preference*;* Paul Slovic, Sarah Lichtenstein and Baruch Fischhoff, research into cognitive processes behind societal-risk taking - the psychometric paradigm (Slovic, 2000); Amos Tversky and Daniel Kahneman's research into the anomalies around human behaviour and judgements made under uncertainty - heuristics and Prospect Theory (Tversky & Kahneman, 1982). All these researchers sought to investigate the dynamics of how people perceive risks, the factors influencing these [the dynamics], and the implications of them [dynamics and influencing factors].

In regards to constructivist approaches, constructivist thinking largely rejects the idea that natural hazards are considered to be "acts of God' external to the social system, and, therefore, abnormalities in the system. Disasters, hazards, and risk are seen as social constructions that do not exist apart from society, and are, therefore, influenced by the dynamics (culture, institutions, organisations, values, beliefs etc.) of the social system (Oliver-Smith, 1996; Tierney, 1999; Weichselgartner, 2001; Johnson et al., 2004). Moreover, the distinction between resource, hazard, disaster and risk is viewed to be socially variable, i.e. what may be considered a flood hazard in one social context may be seen as a agricultural resource in another (Weichselgartner, 2001). Like the rationalist approaches, no one integrating theory of risk and the perception of risk exists (Short, 1984; Clarke & Short, 1993; Tierney, 1999). Instead a research agenda that focuses on investigating how risk is constructed, defined and understood within its context is promoted (Clarke & Short, 1993; Tierney, 1999). This agenda rejects the notions of objective reality and asserts the importance of researching the social relations and meanings underpinning the risk (Clarke & Short, 1993; Tierney, 1999).

An interesting outcome of constructivist research is the focus given to hazards as an integral part of a society. The relationships people have with hazards are based on their perceptions and understanding of the risks and benefits

involved, and determine a society's capacities to cope with them (Johnson et al., 2004). Similarly, focus is shifted away from the belief that technological defense is required to prevent natural hazards to the importance of social measures in the reduction of loss and damages associated with natural disasters (Clarke & Short, 1993). This results in the development of strategies and measures that influence risk perceptions so as to improve the coping mechanisms people and communities have. Amongst these approaches are: Political Ecology (Mustafa, 2002); Social Constructivist Approach (Clarke & Short, 1993; Tierney, 1999); Cultural Theory of Risk, or Cultural Theory (Douglas, 1978; Douglas & Wildavsky, 1982; Douglas, 1985; Oltedal et al., 2004); and Social Amplification of Risk (Kasperson et al., 1988).

Risk perceptions & the adoption (or not) of preparedness behaviours

The different ways that people, both layman and expert (flood and water management), perceive the potential flood risk of an area are believed to affect the decisions they make concerning pre, during and post-event behavioural preparations, reactions and responses (Motoyoshi, 2006; Paul & Routray, 2010). Given this belief the concept of risk perception has continued to be investigated to improve understanding of people's and communities' responses and coping strategies. Case studies from around the world illustrate the use of risk perception in: risk assessment, emergency preparedness and hazard response in Canada (Red River Valley) (Haque, 2000); flood risk assessment in Norway (Krasovskaia et al., 2001); flood mitigation in Slovenia (Brilly & Polic, 2005); the effect of flood risk on property value in Florida, United States (Morgan, 2007); improvement of flood warning, awareness and preparedness in New South Wales, Australia (Becker et al., 2007); flood awareness in the United Kingdom (Burningham et al., 2008); flood risk management in France (Heitz et al., 2009), the Netherlands (Baan & Klijn, 2004), and Hungry (Vari et al., 2003); and community disaster preparedness in Japan (Motoyoshi, 2006). However, despite the view that risk perceptions provide insight into hazard preparedness

behaviour, only tentative links and relationships have been found between risk perception and conation[6] (Bubeck et al., 2012).

Indeed a number of factors and variables have been found to influence people's risk perceptions and behaviour. Norris et al. (1999) found that people associate a greater risk and severity to hazards with more adverse consequences (i.e. loss of life and property). However, such associations are often overestimated, as hazards that are dramatic and sensational tend to rely on judgement heuristics that allow for error, in that they result in bias that negates actual probability measurements (Tversky & Kahneman, 1982). Hence people's estimates of hazards often: 1) overestimate infrequent causes of death while underestimating more frequent causes; and 2) tend to overestimate causes of death that are dramatic and sensational, and underestimate causes of death from unspectacular events that generally claim one victim at a time (Johnson & Tversky, 1983).

Experience is a key variable of interest in preparedness behaviour (Norris et al., 1999). However, research into the topic is still developing opinions about the role experience plays in peoples' behavioural choices. In his in-depth review of the topic Weinstein (1989) found the relationship between experience and behaviour to be transient and weak, and Shaw et al., (2004) concluded that earthquake experience in Japan was not the primary factor contributing to awareness. Grothmann & Reusswig (2006), Norris et al. (1999) and Peters-Guarin et al. (2012) suggest that the nature of the experience individuals and communities have of an event will have a significant influence on their knowledge of the risks associated with it, and assessment of those risks in terms of preparing for them and managing them. Norris et al. (1999) found that people who had experienced Hurricane Hugo were more likely to not only adopt precautions for future hurricanes, but also in other areas of their lives (e.g. crime and motor vehicle accidents). Twigg's (2004) work in flood-frequent context observes that in areas where natural hazards are not new to people,

[6] The mental faculty of purpose, desire or will to perform and action.

they will work out their own methods for protecting themselves and their livelihoods ('indigenous knowledge').

Encounters with news involving risk, threat and disaster commonly generate feelings of fear, anxiety, worry or even anger (Johnson & Tversky, 1983). Where hazard experience seems to waiver in its ability to shift people's risk perceptions and preparedness motivations, it has been suggested that its not so much the experience itself, but how people have interpreted their experiences or what they have learned from them that is important. Past experience can stimulate risk perception development through emotions that are important for stimulating adaptive behaviour (Siegrist & Gutscher, 2008). Terpstra (2011) found in his study in the Netherlands, that negative emotions from previous experience with storm surges had a positive influence on risk perceptions and a negative influence on trust in public protection. However, his results were unable to show a direct link between experience and flood preparedness intentions. In addition, even with previous flood experience several of Terpstra's (2009) respondents appeared to misinterpret it and have low risk perceptions and refuse to protect themselves from future event probabilities. In a study done with flood victims, Siegrist & Gutscher (2008) found that those that reported having negative experiences (i.e. experienced uncertainty, insecurity, fear, shock and helplessness) were more likely to have taken substantially more precautionary actions against future floods than non-victims. In other studies, although, fear, anxiety and preoccupation were found to facilitate protective action, depression associated with repeated exposure has been found to inhibit such action (Weinstein, 1989).

Other factors influencing risk perceptions and preparedness behaviour include: gender (Fothergill, 1996; Gustafson, 1998); race and ethnicity (Fothergill et al., 1999); trust and confidence in public protection (Grothmann & Reusswig, 2006; Terpstra, 2009) and awareness (Andjelkovic, 2001; Jha et al., 2012). From a sociological perspective Clarke & Short (1993) suggest that issues related to: the collection and use of information by decision makers; the role of power in the allocation and management of resources; how power work in framing the terms of debate about risks; the role of media in presenting and informing about

risk; the influence organised interest groups have over risk policy; and the role of organisations, elites and professionals (including experts) in framing the issue of risk, and their decisions, also have significant influences over how people perceive risk and choose to respond (or not). Additional factors identified by rationalist and constructivist approaches as affecting the social perception of risk as it relates to hazards are presented in Table A.5 (Appendix A).

2.3 Protection Motivation Theory

In an alternative perspective, determining what inspires or limits adoption of hazard adjustments has been a significant topic in behavioural and social psychology (Leventhal et al., 1965; Rogers, 1975; Mulilis & Duval, 1995; Lindell et al., 1997). This field has sought to determine the cognitive (Leventhal et al., 1965; Rogers, 1975; Ajzen, 1991; Mulilis & Duval, 1995; Lindell et al., 1997) and emotive (Lazarus & Folkman, 1984) processes that might be influencing how people determine to act. These processes are described within models and frameworks that explore, describe or explain the mediating relationships that exist between perception of risk and conation. Such relationships are often innately tied to contextual and informational factors, such as those described in the previous section.

The role and effect of risk communication on influencing people's coping responses has played a principle part in the research into behaviour intent and attitudes (Rogers, 1975; Mulilis & Duval, 1995, 1997; Lindell et al., 1997; Duval & Mulilis, 1999; Terpstra, 2009). Working under the premise that information alone is insufficient in providing impetus to change attitudes and actions, this research has looked at how risk communication could create motivating forces that changed people's attitudes and behaviour (Leventhal et al., 1965). A significant view on this is the role of fear appeals (Rogers, 1975) or negative threat appeals (Mulilis & Duval, 1995, 1997; Duval & Mulilis, 1999) on people's appraisal of their situations and adjustment choices. Essentially how people cope with the unease or fear [stress] that occurs in response to risk messages (Rogers, 1983).

Attitude-behaviour theories provide frameworks for exploring the relationship between the attitudes people hold and their choice and adoption of protective responses (Rogers, 1975, 1983). The most prominent of these theories are: Theory of Reasoned Action (TRA, Fishbein & Ajzen, 1975); Theory of Planned Behaviour (TPB, Ajzen, 1991); Person-relative-to-event (PrE) Theory (Mulilis & Duval, 1995); and Protective Action Decision Model (PADM) (Lindell & Perry, 1993, 2004; Lindell & Whitney, 2000) (Table A.6, Appendix A). The core conceptual roots of these theories are based on 'expectancy' and 'value' (Rogers, 1975). Tendencies to act are seen to be functions of the expectancy people have that a given act will be succeeded by some consequence and the perceived value of that consequence (Rogers, 1975; Mulilis & Duval, 1995). Essentially these behavioural theories believe that people will utilise problem-focused coping mechanisms (i.e. actions/activities that reduce the risk) when they believe that their actions will make a difference to the extent of the threat and that they themselves are capable of undertaking these actions (Rogers, 1975; Terpstra, 2009).

When investigating people's decisions related to flood adaptations and precautionary behaviour, two behavioural-intention theories have been applied in the literature, these are PMT (Grothmann & Patt, 2003; Grothmann & Reusswig, 2006) and PADM (Terpstra, 2009). Although not the focus of this study, Terpstra's (2009) doctorate thesis looked at the issues of flood preparedness in the Netherlands, and investigated, using PADM as a framework on how the thoughts, feelings and perceptions of the Dutch public influence their flood preparedness behaviour. Their findings indicated that few Dutch citizen's vulnerable to future floods are currently intent to prepare in event of a flood. PADM was first developed to help explain the protective action decisions people make in response to earthquakes (Lindell & Perry, 2004). Like PMT, PADM links theoretical concepts regarding cognitive processes with communicated information to understand people's protective behaviour. However, PADM examines more the decision processes people consciously make regarding protective behaviours, as opposed to the conscious and unconscious cognitive processes leading to the motivation people may or may

not have to undertake precautionary behaviour. Both theories present viable approaches to the assessment of behavioural intentions residents in flood-vulnerable areas have to protect themselves. In terms of this study, PMT has been selected for its conceptual conciseness, and based on its longer standing as a behavioural-intention theory, and the presence of a more diverse array of studies testing and refining the theory in both the health (Milne et al., 2000; Norman et al., 2004) and environmental hazard (Floyd et al., 2000; Bubeck et al., 2012) literature.

2.3.1 Theoretical points & development of PMT

PMT was developed by Rogers (1975) as a mechanism for understanding the affect of the components of fear appeals on attitude-change. Fear appeals were seen as the content of communications that described unfavourable consequences in the advent that some form of protection measure (most often the one being recommended by the communicator) was not utilised (Rogers, 1975). These fear appeals were believed to stimulate cognitive mediating processes that acted to appraise the risk and motivate shifts in attitudes that encouraged the person to adopt the recommended response (e.g. stop smoking, put on seat belt, take medications etc.) (Figure 2.2).

Following Hovland et al.,'s (1953 cited in Rogers, 1975) expectancy-value theories, Rogers (1975, pp. 97) identified three "*crucial stimulus variables*" in a fear appeal:

1. The magnitude of noxiousness of a depicted event;
2. The conditional probability that the event will occur provided that no adaptive behaviour is performed or there is no modification of an existing behavioural disposition;
3. The availability and effectiveness of a coping response that might reduce or eliminate the noxious stimulus (Figure 2.2).

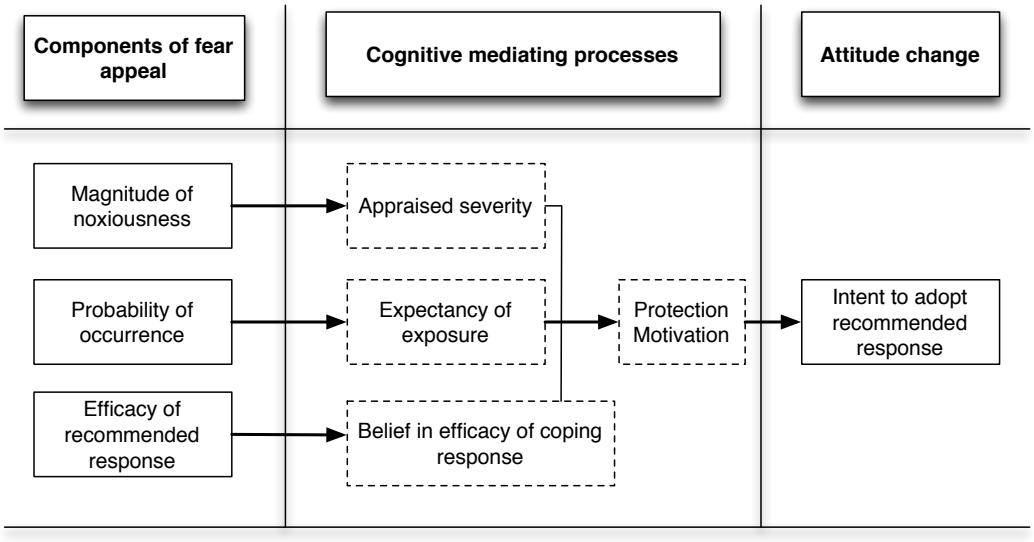
According to Rogers (1975) risk communicators could utilise these components individually in a message, as a set, or in combination with each other. Because fear can be used to manipulate in any number of ways (e.g. information between seriousness of a potential hazard and the likelihood of exposure to that

hazard could be varied, or alternatively focus on just one aspect), the assessment of the influence of fear appeals on attitude change, and motivation to act is complicated (Rogers, 1975).

Rogers (1975) postulated that each of the three identified components of fear appeals, are believed to initiate a cognitive mediating process (Figure 2.2). Each process provides information from which the severity of an event is appraised, the expectancy of exposure to the event is assessed, and belief in the efficacy of the coping response (suggested in the fear appeal) is developed (Rogers, 1975) (Figure 2.2). Rogers (1975) assumes here that each of the cognitive mediating processes occur independently of each other, and that each appraisal process will be proportional to the strength of the environmental variable (component of fear appeal). These processes are seen by Rogers (1975) as being representations of external and internal events, which are connected to observable events (e.g. smoking causes harm, not wearing your seat belt increases your chances of coming to harm in an accident, not taking your medicines reduces your chances of getting better or increases your chances of contracting additional complaints) and measurable responses (behaviour).

According to Rogers (1975) Protection Motivation is an outcome of these three cognitive mediating processes and is generated by them to mediate the effects of the components of fear appeals on their attitudes (Figure 2.2). Relative to the amount of protection motivation aroused, the intent to adopt the communicator's recommendation is mediated (Rogers, 1975). Protection motivation is thus seen by Rogers (1975, pp. 98) as "*an intervening variable, and has the characteristics of a motive: it arouses, sustains and directs activity*". Therefore, PMT's basic proposition is that protection motivation is generated from the cognitive appraisal of a depicted event as being noxious and likely to occur, and that suggested response recommendations are indeed sufficient to provide protection against the occurrence of an aversive event (Rogers, 1975). Conversely if an event is not appraised as being too severe, that it is unlikely to occur, and/or there is nothing to be done, then no protection motivation would

be aroused and that there would be no change in behavioural intentions (Rogers, 1975).



(Source: adapted from Rogers, 1975)

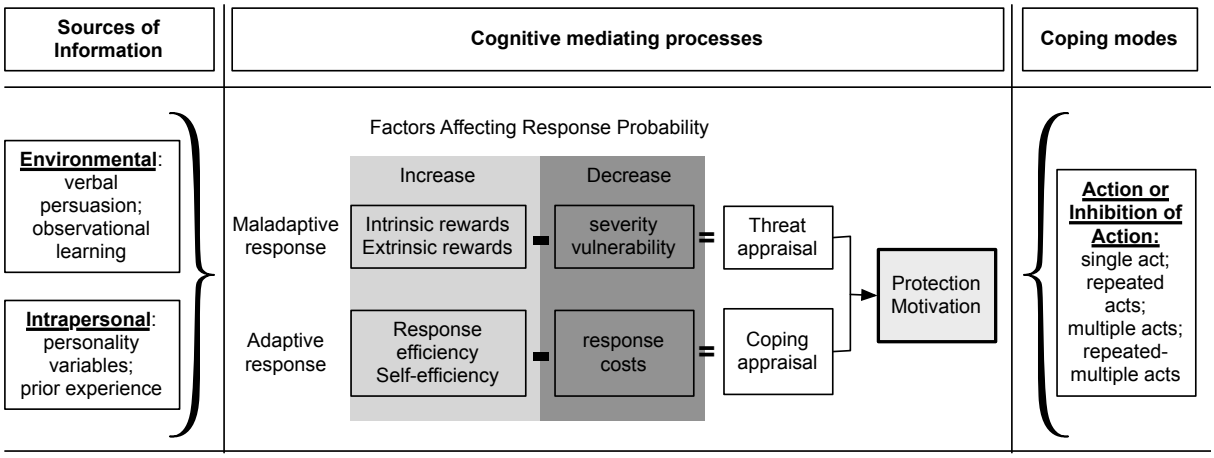
Figure 2.2 The Protection Motivation Theory by Rogers (1975).

Following subsequent research and testing, as well as reviewing the developments in the field of fear appeals and protection motivation, Rogers (1983) revised and extended his theory. Within his revised theory he included (Rogers, 1983, pp. 167):

1. A broader statement about the sources of information (SOI) initiating the coping process;
2. Additional cognitive mediating processes; and
3. A fuller exposition of the modes of coping.

Figure 2.3 presents the 'schema' of Rogers' (1983) revised Protection Motivation Theory. In terms of the first point, instead of fear appeals and their three components (Rogers, 1975), the revised PMT model now considered environmental and/or intrapersonal SOI (Rogers, 1983). Environmental SOI can include: verbal persuasion (especially fear appeals) and observational learning (seeing what happens to others or has happened to others through historical SOIs); interpersonal sources include prior experiences with similar threats (including feedback from coping activities) and personality variables (attitudes, beliefs, values) (Rogers, 1983). In addition, the revised version of PMT no longer considers individual components of information sources to be linked to

specific cognitive processes, instead any source of information can lead to any of the mediating processes (Rogers, 1983). In effect the new focus of the revised PMT is on the cognitive mediating processes themselves regardless of information source, unlike the initial version that emphasised the influencing properties of the components of fear appeals (Rogers, 1975; Rogers, 1983).



(Source: adapted from Rogers, 1983)

Figure 2.3 Revised Protection Motivation Theory by Rogers (1983).

Cognitive mediating processes seen as being initiated by information sources are now summarised within the terms 'threat appraisal' and 'coping appraisal' (Rogers, 1983). These cognitive processes are described as being appraised of:

- Either maladaptive or adaptive response(s), and
- The variables increasing or decreasing the probability of the response.

In terms of maladaptive responses these could include a current behaviour (e.g. smoking excessively) or one that could be adopted (e.g. start to smoke). Factors influencing the promotion (i.e. positive reinforcers; increased probability) of maladaptive response/s include both intrinsic rewards (e.g. bodily pleasure, satisfaction) and extrinsic rewards (e.g. social approval) (Rogers, 1983). Alternatively factors that decrease the probability of maladaptive responses are severity (e.g. bodily harm, impacts to self-esteem, effects on family and work relationships) of the threat and the expectancy of being vulnerable to the threat (Rogers, 1983). The framework then assumes an

algebraic relationship between these two sets of influencing factors, which produces the final appraisal of threat (threat appraisal) (Rogers, 1983).

Beliefs that influence the promotion of adaptive responses (e.g. stopping smoking), involve those that see the recommended coping response as effective (response efficiency; stopping smoking will reduce my chances of lung cancer), and that assure the person that they can successfully perform the coping response (self-efficiency; e.g. I can stop smoking) (Rogers, 1983). Alternatively any costs associated with the coping response recommended (e.g. inconvenience, expense, unpleasantness, difficulty, complexity, side effects, disruption of daily life, and overcoming habit strength), can reduce the chances of adaptive responses being adopted. The algebraic relationship of these factors results in coping appraisal. Self-efficacy is one of the more significant new additions to the revised theory. Self-efficacy is seen as a "*belief that one is or is not capable of performing a behaviour*" (Rogers, 1983, pp. 169).

Protection motivation is then seen as a function of the relationship between threat appraisal and coping appraisal, Rogers (1983) see this variable being measurable through behavioural intentions. Rogers' (1983, pp. 170) revised version of PMT thus acts under the following assumptions: "*the motivation to protect oneself from danger is a positive linear function of four beliefs: 1. The threat is severe, 2. One is personally vulnerable to the threat, 3. One has the ability to perform the coping response, and 4. The coping response is effective in averting the threat. Furthermore, the motivation is a negative linear-function of: 1. The reinforcements associated with the maladaptive response, and 2. The response costs*". Heuristic judgements are believed to add bias to each of the appraisal processes (Tversky & Kahneman, 1981, 1982), and it is believed by Rogers (1983) that these biasing processes will limit the ability to clearly (one-to-one) map the links between the information being received and the degree of protection motivation ignited, however, the final individual appraisals will reflect these links.

In the last step of Rogers' 1983 PMT framework, protection motivation is then considered to have an influence on the type or mode of coping the person is

motivated to perform (Figure 2.3). These coping modes can be single acts, repeated acts, multiple acts or repeated-multiple acts. Alternatively coping can include not only the taking of direct action (i.e. actively do something, e.g. stop smoking), but also the inhibition of action (i.e. not start something, e.g. do not start smoking) (Rogers, 1983). Within this new framework, Rogers (1983) moves his theory of Protection Motivation beyond fear appeals and persuasion, and makes it sufficiently broad to apply to any situation involving threat (e.g. health behaviour, natural hazard behaviour - flood protection behaviour).

2.3.2 Application of PMT in natural hazard research

PMT has been predominately utilised within research related to health behaviour (e.g. sexual behaviours, cancer-related behaviours, medical adherence behaviours) (Floyd et al., 2000; Milne et al., 2000), this research has taken two broad forms: the manipulation of the components of PMT (through persuasive communications) to evaluate their effects on protection motivation and relevant behaviours; and secondly PMT has been used as a social cognition model to predict health behaviours (Norman et al., 2005). An initial review of this research can be found in Boer & Seydel (1996), and an updated review in Norman et al., (2005), however, for the purposes of this study focus is placed on PMT as it has been utilised in natural hazard research.

Despite the wider application value of Rogers' (1983) revised model, the extent to which PMT has been used in research relating to hazard preparedness behaviour is not large. Mulilis & Lippa (1990) published one of the first papers to utilise PMT in hazard behaviour investigations. These author set out to test the ability of PMT to predict earthquake preparedness behaviour relevant to subtle shifts in persuasive messages. In their study they carried out an experiment with 111 homeowners in California, in which they assessed the effects of persuasive messages on changing homeowners' intentions to undertake behaviours to prepare for earthquakes, over a five-week period. They determined that persuasive elements in risk messages could manipulate significant changes in earthquake behaviour, and that the cognitive variables

(probability of occurrence; severity of damage; effectiveness of preparation; capability of preparation) of PMT do affect behaviour.

In 1992 Wiegman et al., published findings of their surveys that investigated the contribution of four of the components (perceived severity; perceived probability; response efficacy; self-efficacy) of PMT in predicting behaviour in regards to cancer, technological and environmental risk, and criminal victimisation. In regards to both cancer preventative behaviours and protest activities to the proposed development of a chemical plant, the authors found positive correlations between the four PMT components and reported behavioural intentions, however, they did not find significant correlations in regards to burglary preventative measures.

Martin et al. (2007) utilise PMT and the Transtheoretical Model (TTM) to investigate the cognitive perceptual process that homeowners go through when deciding on property protection against wild-land fires in the United States. Their research included the additional variable of 'subjective knowledge' that included any personal experience a homeowner had, as well as the nature of their knowledge of the threat. They carried out surveys in Colorado and Oregon, and found that homeowners with low knowledge contemplation or who are in the pre-contemplative stage are motivated by their perceived vulnerability more than any of the other perceptual components of PMT, however, those with high knowledge were motivated by perceived severity of risk. Of interest was their finding that low-subjective knowledge homeowners were observed to be engaging in risk reduction behaviours without the influence of PMT components, and the authors proposed that these behaviours were motivated by the desire to emulate others in their community.

More recently, Mankad et al. (2013) undertook a study to understand why some urban residents choose to become early adopters of decentralised water technology, whereas others are resistant to change. Their study focused on the adoption of water storage technology in homes in south-east Queensland, Australia, that are at risk of water shortages. They constructed a framework based on PMT components to examine whether relevant psycho-social factors

are reliable indicators of adaptive behaviour towards the installation of rainwater tanks. In this regard they sort not to test PMT but to explore the relationships between the components and intentions to install rainwater tanks. In addition to the components of PMT (perception of knowledge; perceptions of water shortage threat; response efficacy and response costs), these authors included measures for subjective and social norms to account for the importance of normative evaluation by people's water conservation decisions published in other research on the topic. They found that response efficacy, threat appraisal, response costs, subjective knowledge and subjective norms (listed in order of relative contribution) all contributed to the prediction of rainwater tank adoption.

The above studies all indicate the growing use of PMT in preparedness behaviour research. All the above studies indicate positive results towards the applicability of the theory to determining and understanding why people do or do not undertake precautionary actions when faced with the awareness of a potential hazard.

2.3.3 PMT & Flood preparedness

The application of PMT in studies interested in investigating flood preparedness behaviours does not appear to be extensive - based on the literature found for this study. Only two studies could be found that look at PMT in regards to flood preparedness (Grothmann & Reusswig's, 2006; Zaalberg et al., 2009), although in the last two years the interest in this theory has increased as is evident by additional studies that have been newly published (Bubeck et al., 2012; Bubeck et al., 2013; Koerth et al., 2013). Interestingly all of these studies have been based in north-west Europe amongst Dutch, Danish and German communities. Also all of these studies have sort to quantitatively investigate the factors influencing flood preparedness behaviours.

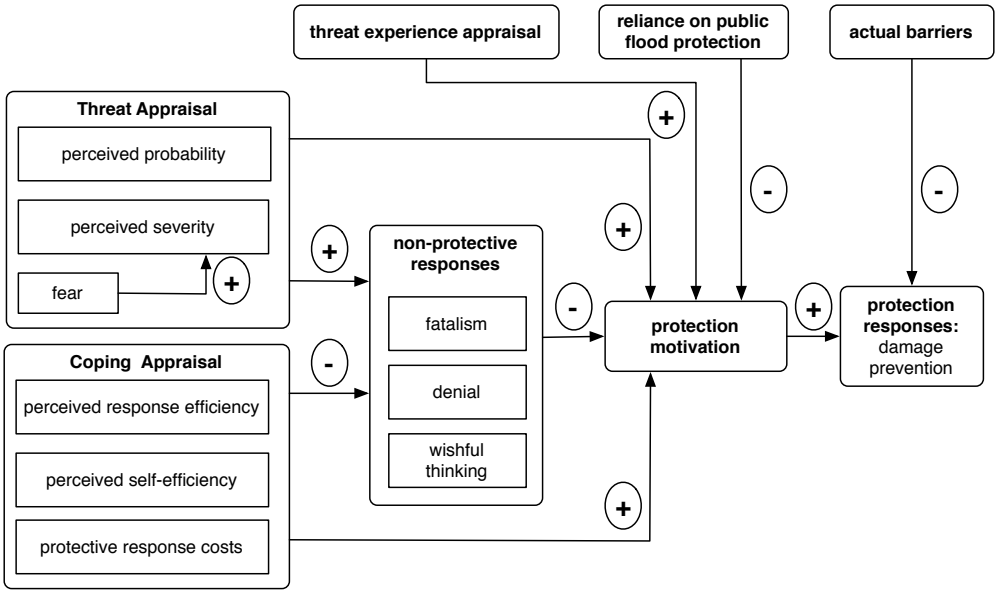
In the Netherlands, future flood risk due to climate change is of significant interest and concern (Terpstra & Gutteling, 2008; Terpstra, 2009; Zaalberg et al., 2009; Terpstra, 2011). Given that the areas protected by dikes are inhabited by about 60% of the population and account for 65% of the Dutch

GDP, these areas are at risk of widespread damage and devastation from potential future floods (Terpstra, 2009). The estimated increases in future flooding due to rises in sea level, increased river discharges, and higher precipitation have lead the Dutch government to recognise that more than just the raising of the dikes is necessary to reduce damages in vulnerable areas (Terpstra, 2009; Zaalberg et al., 2009). The challenge the Dutch government faces is to increase flood awareness and preparedness among individual residents. Zaalberg et al. (2009) investigated the psychological factors capable of motivating individuals to effectively cope with future flooding, more specifically they investigated the link between past flood experience and future coping. In order to explore the intervening variables that may have an impact on this link, these authors looked at respondents' affective appraisals (e.g. fear appeals, negative emotions, concern and worry) as they relate to past flood experience and cognitive appraisals (e.g. threat appraisal, coping appraisal). They determined that past flood experience does act as a motivating force to increase the preparedness intentions, they also found evidence to support that not only threat appraisal should be included as part of a model explaining experience-coping links, but also coping appraisal. In fact this study found larger correlations between respondents' perceived efficacy for protecting their property and adoption intention, than between risk perception and adoption intention, suggesting that coping appraisal has a greater predictive validity of intentions and behaviour than threat appraisals (risk perceptions). Interestingly, this is a finding that is reported from numerous PMT health-behaviour orientated studies, as reported in the two meta-analysis review papers of Floyd et al. (2000) and Milne et al. (2000), which included 27 studies (n=+/- 7694) and 65 studies (n=+/-30 000) respectively. High-risk perceptions have in fact been seen to correlate better with non-protective responses than protective ones (Milne et al., 2000). A finding supported by Grothmann & Reusswig's (2006) and Zaalberg et al.'s (2009) studies on flood preparedness. Alternatively coping appraisal components (perceived response efficacy, self-efficacy and costs) have been found to correlate negatively with non-protective responses and positively with adoption of protective measures (Bubeck et al., 2012).

More recently Bubeck et al. (2013) has taken this observation and published a study that looked at the influence of the three sub-components of coping appraisal (i.e. perceived self-efficacy, perceived response efficiency, and perceived personal cost) on precautionary flood behaviour in 752 flood-prone households along the German part of the Rhine River. These authors believe that the positive relationship being observed between these sub-components and flood behaviour is important in terms of integrated flood management and flood-risk policies. This is because such insights can guide the emphasis in flood-risk communications on response efficiency (i.e. effectiveness of mitigation measures), practical guidelines on how to employ response options (i.e. self-efficacy) and/or whether costs associated with response options should be addressed when stimulating protective behaviour (i.e. response cost). Their results confirmed that coping appraisal is an important variable in terms of precautionary behaviour, and that response efficiency and self-efficacy represent the most influential coping appraisal variables; therefore, risk communication is recommended to focus on information concerning the effectiveness of mitigation options, and on practical guidelines on how these should be implemented by private households.

In a study that looked at both Danish and German households, Koerth et al. (2013) investigated the question of what motivates coastal dwellers to adapt proactively to rises in sea levels and associated flood events. These authors employed PMT to help understand the behaviours being observed in coastal households. Their results supported Zaalberg et al.' s (2009) finding that personal flood experience was a significant explanatory factor in observed behaviours. In addition they determined that PMT predicts the implementation of small-investment measures, however, does not explain the implementation of high-investment measures, and thereby supported Bubeck et al.'s (2013) premise that risk communication should include variables related to adaption behaviour. They recommended that future research needs to consider the role costs plays - specifically high-investment adaptation measures.

A paper that has received significant attention in the literature around flood preparedness and private adaptations is Grothmann & Reusswig's (2006) paper. In their paper, these authors adapt PMT to explain the variance in households', long-term precautionary action to avoid flood property damage in flood-prone areas in Cologne, Germany. Figure 2.4 presents their adapted PMT framework. The core components of the framework are the same as Rogers' (1983) model, i.e. threat appraisal and coping appraisal, which are seen to motivate either non-protective or protective responses. Table 2.2 provides a summary of the description of these components, as well as information on the sub-components seen to have a mediating effect on these processes, also identical to Rogers' (1983) model, i.e. perceived probability, severity and fear, and perceived response efficiency, self-efficiency and costs. As well as shifting the layout of Rogers' (1983) model to better reflect relationship dynamics determined in the literature since Rogers first developed the theory, the authors added two additional components: threat experience appraisal and reliance on public flood protection (Table 2.2).



(Source: adapted from Grothmann & Reusswig, 2006)

Figure 2.4 Explanatory factors for precautionary behaviour adopted by residents in flood-prone areas. + Or - used to indicate the effect of the different components on response options.

Table 2.2 Perceptual processes believed to influence the generation of protection motivation amongst residents at risk of flooding.

Perceptual process	Mediating Sub-components
Threat Appraisal (or risk perception): • Describes how a person assesses a threats probability. • Describes how a person assesses the damage potential of things they value.	*Perceived Probability:* • Person's expectation of being exposed to a flood.
	Perceived Severity: • Person's estimate of how harmful the consequences of a hazard would be to the things they value.
	Fear: • Plays an indirect role by influencing the estimate of severity of the danger.
Coping Appraisal: • Takes place after the threat appraisal process. • Is initiated only if a specific threshold of threat appraisal is passed.	*Protective response efficacy:* • The belief that protective actions will be effective in protecting oneself and others from harm.
	Perceived self-efficacy: • An individual's perceived ability to carry out or perform a protective response.
	Protective response costs: • The assumed cost of taking the preventative response (i.e. financial, time, and personal effort).
Treat Experience Appraisal: • Assess the severity of past hazard experience.	
Reliance on Public Flood Protection: • The presence of other agents to carry out protective actions	

(Source: adapted from Grothmann & Reusswig, 2006).

In terms of responses, Grothmann & Reusswig's (2006) model suggests that protective measures will be taken when both threat and coping appraisal are high, and non-protective responses taken when threat appraisal is high, but coping appraisal low, or both are low. Protection motivation takes place when an individual chooses to take action, however, might not lead to actual behaviour if variables such as time, money, knowledge or social support are not available. It is therefore, necessary to distinguish between intention and actual behaviour. Whereas high threat perception has been seen to promote response – protective and non-protective – non-protective responses have been observed to inhibit protection motivation (Grothmann & Reusswig, 2006). These authors then test the hypothesis that threat experience appraisal, threat appraisal, and coping appraisal should correlate positively with protective responses, and reliance on public protective measures correlate negatively with protective responses. From their survey of 157 German households, from varying flood-risk zones in the city of Cologne, they deduced that for most protective responses, examined in their study, the relation between the perceptual variables of their model were consistent with their hypotheses.

Unfortunately, no further research into the application of PMT in the assessment of perceptual variables and flood preparedness behaviour could be found. It does, however, appear to be an interesting idea and concept that bears taking further and testing in other regions of the world as well as exploring with qualitative analysis.

2.4 Chapter Conclusion

Research is suggesting that local flood preparedness and coping strategies have the ability to reduce potential damage occurred during a flood event. Therefore, understanding why some prepare and why others do not is valuable to risk reduction approaches.

Coping strategies represents collections of activities and/or mental processes, which people have established to help them deal with stressful situations. They most often are considered to include protective actions that people take to diminish the actual impact of a stress (hazard) on their lives. However, non-protective (disengaged) strategies that work at only diminishing the cognitive and affective discomfort caused by knowledge of a hazard and its risks are also employed.

Much research has been undertaken, but in terms of perceptions of risks towards natural hazards like floods many questions still exist. It is clear that risk perceptions are not only dependent on cognitive or affect variables, but are intimately linked and influenced by cultural and social factors. However, only tentative links have been formed between risk perceptions and behaviour, and there is still a significant gap in our understanding of them, and how they do or do not influence choice around preparedness behaviours.

So far the studies utilizing PMT in flood-preparedness investigations, have shown positive findings in regards to its usefulness in explaining and describing why some might be protectively responding and others not. However, this literature is still fledgling and restricted to quantitative studies in western European countries.

From the literature reviewed in this study, its clear why some people take action and others do not still requires exploration. This thesis places itself within this area of focus, and aims at improving our understanding of this social phenomenon as well as provide points of elaboration for PMT by utilizing it in a qualitative study of protection motivation in a western European and south-east Asian context.

Chapter 3 Research Methodology & Methods

This chapter presents the research framework (Figure 3.1) developed for this study, and in so doing highlight the key assumptions that underpin this research. The research framework adapted for this study is based on Saunders et al.'s (2012) 'research onion' framework, this is considered to provide a concise description of the 'layers' or 'lenses' utilized in most research. Figure 3.1 presents the research framework and the breakdown of this chapter.

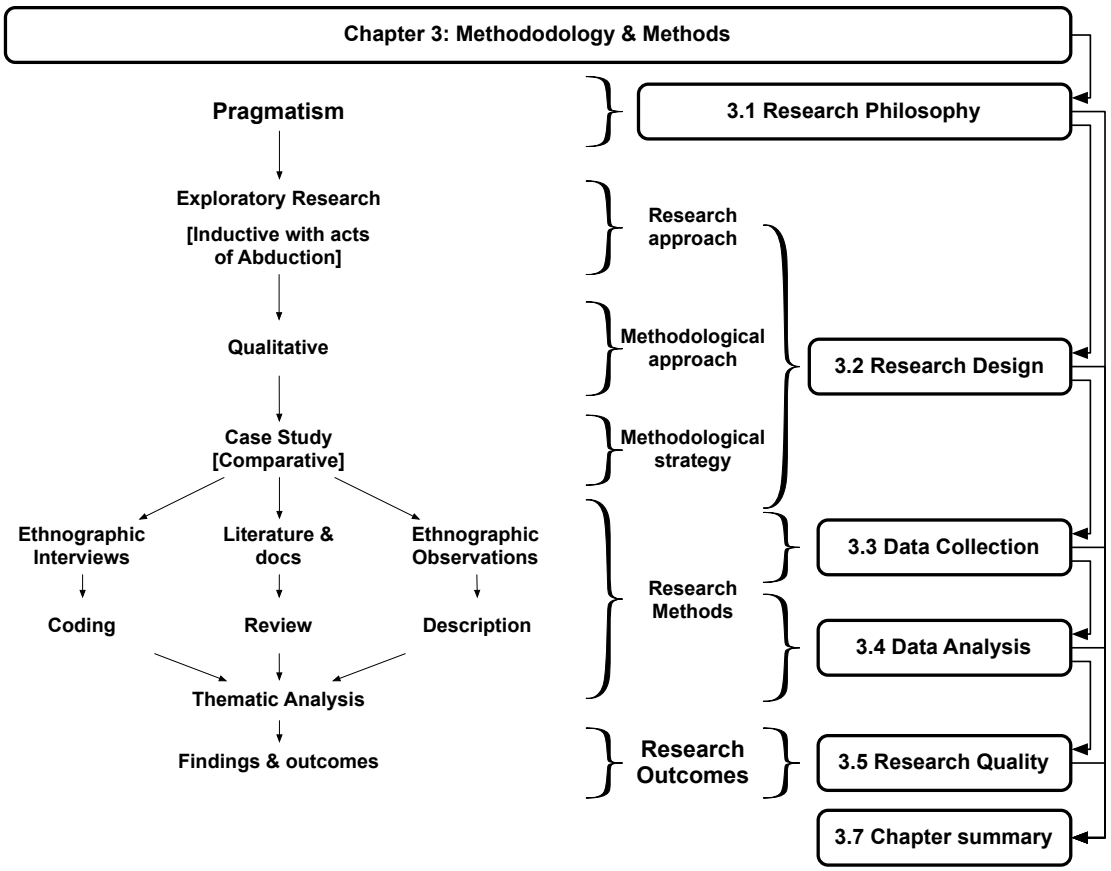


Figure 3.1 Research framework and chapter breakdown.

3.1 Research Philosophy

The research philosophy making up the foundations of this study is Pragmatism. Pragmatism is a philosophy of knowledge construction that considers practical solutions to research questions, as well as emphasising the consequences of the inquiry (Giacobbi et al., 2005; Friedrichs & Kratochwil, 2009). The core maxim of pragmatic thinking is that our beliefs are really rules for action, and that to make meaning of something we, therefore, need to

determine its conduct, and the practical outcomes or consequences of this (James, 1907; Hookway, 2008). Disciplines in which pragmatic thinking has been utilised include: the fields of social science and international relations (Friedrichs & Kratochwil, 2009); information systems (Goldkuhl, 2012); sport psychology (Giacobbi et al., 2005); and geography (Barnes, 2008; Bridge, 2008) - to name a few. Table 3.1 lists the key implications of pragmatic thinking to this study.

Table 3.1 Key pragmatic principles and their implications to this research.

Pragmatic principle	Description	Implication	Reference
Importance of context	Knowledge is constructed through experience, and this experience is contextualised by the environments and time frames in which they occurred	• Context is considered as influential in knowledge & awareness within the cases. • Description of concepts within case sites, are unique to their context. • Uniqueness of contexts limits the extent of generalisablity of findings. • The validity of findings is innately tied to the contextual elements.	Giacobbi et al., 2005; Friedrichs & Kratochwil, 2009
Concepts as the building blocks of analysis and outcomes	Pragmatism does not represent a 'machine for explanation', but instead a means for thinking about thinking.	• Concepts are the core points of exploration (Section 3.2).	Barnes, 2008; Friedrichs & Kratochwil, 2009
Consensus Theory of knowledge	• Pragmatism sees the absence of an objective reality[7]. • Inter-subjective generation of truth & knowledge.	• To understand the way in which people are thinking & behaving it is necessary to view their knowledge and experiences as subjectively formed. • As most people do not live in isolation, this knowledge & experience will embody the collective, inter-subjective views of community members.	Friedrichs & Kratochwil, 2009
Epistemological Instrumentalism	Knowledge is interpreted as an instrument for determining practical solutions to societal dilemmas.	• By this the author interprets knowledge as an instrument to use in the generation of interpretation and understanding of social phenomena.	Friedrichs & Kratochwil, 2009

[7] However, the author does not stipulate the absence of a separate reality, only that within social systems people live within subjective interpretations and perceptions of the world they live in and challenges they face.

Pragmatic principle	Description	Implication	Reference
The best approach & methods for the job.	Unless a methodological approach is expressly stated in the research questions, it is possible to consider and/or work with different philosophical and methodological positions	• Methodological considerations of this study have included methodology that facilitates valid exploration of the research concepts (Section 3.2). • Use of multiple theories, perspectives and methods in order to explore & understand the phenomenon of interest are not seen as invalid approaches (Section 3.3 & 3.4).	Saunders et al., 2012

It is acknowledged that other research philosophies will consider the lack of generalisable findings as a significant shortcoming of this approach, and also a negative influence on reliability of the research. Pragmatists, however, do not see this, but instead consider it an outcome of seeking practical research with societal benefits.

3.1.1 Position of researcher & the issue of subjectivity

Given the need to spend extended periods of time in each case site and the limitations associated with available time and resources, the author took the position of 'interested intellectual' as opposed to 'participant' in the research. Her experience and approach did carry a degree of personal participation within the research process, however, not one that involved her direct involvement in preparing for floods.

The author acknowledges that aspects of her own experience and worldviews will inevitably invade the process. Indeed her subjective experiences of the world need to be acknowledged and reflected on throughout the research process.

- Although, not opting to utilize the first person to show subjectivity, the author has attempted throughout the research process to offer different interpretations to data and findings in an effort to maintain rigour and validity in her exploration of the social phenomenon around flood preparedness in urban communities.

- She has been careful to show her interpretation and opinion throughout this thesis, and chosen to simply refer to herself as 'the author'.
- Given the presence of subjective interpretations the author actively encourages further testing and validating of her findings and continuous dialogue towards a consensus of knowledge in regards to this social phenomenon.

3.2 Research Design

The research design is the general plan of how the research questions will be answered (Saunders et al., 2012). The following sections discuss the research design adopted in this study, why it was selected, and its strengths and limitations.

3.2.1 Logic & reasoning

The two logic or reasoning approaches used in this study are induction and abduction. Both are amplicative approaches, meaning that both are used to amplify and generalize experiences, as well as broadening and deepening empirical knowledge and understanding (Reichertz, 2004; Vickers, 2006). Induction is the processes where by theory (rules, laws etc.) is determined from observation of the general (Rothchild, 2006). According to the pragmatist Charles Peirce abduction is the means by which people find explanation for observed facts (Richardson & Kramer, 2006).

The '*intellectual foundations*' of explorative research involve inductive logic (Stebbins, 2001, pp. 25). In this regard, the findings of this study are used in the development of suggested hypotheses, based on the interpretation of findings. However, given the nature of social research, and the role context plays in shaping experiences, cognition, affect and conation, abductive reasoning is utilized in the determination of explanations for the findings and generation of interpretations specific to the different case sites.

The use of inference during abductive reasoning processes can be seen as a limitation to research. This is true as the applicability of such inferences need not be valid. However, Friedrichs & Kratochwil (2009) emphases the need to

be explicit and conscious about one's research questions, and in the event that the concepts used to make sense of a phenomenon do not add to the addressing of these questions, then a researcher must be able to reject or refine the concepts. In this way abductive reasoning enables a social researcher to bridge the unknowns encountered in addressing their research questions. Therefore, utilizing both inductive and abductive reasoning is believed to better facilitate the exploration of the phenomenon and addressing of the research questions. Figure 3.2 shows the path of reasoning as implied by the author in the current study.

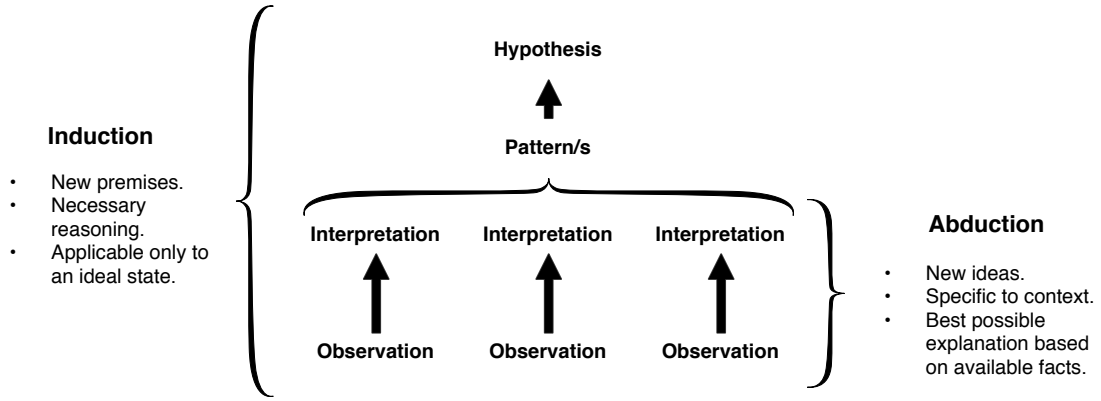


Figure 3.2 Reasoning framework for the current study.

3.2.2 Qualitative Research

There is currently a need to undertake research that extends our conceptual understanding of the components of PMT as they relate to flood preparedness within varying contexts and cultures. Qualitative research approaches offer the means for achieving this context-specific depth and elaboration (Merriam, 2002; Golafshani, 2003; Dudwick et al., 2006; Saunders et al., 2012). As such the current study has adopted a qualitative approach. The analysis of this data, may carry issues of generalisability and subjectivity, but would enable the development of a deeper understanding of what residents in the case studies are thinking and believing about the flood risk/s they face, as well as the motivation they have to protect themselves.

Qualitative research involves the collection of first-hand data by a researcher who is interacting and speaking (interviewing) with those involved in the

phenomena of interest. Through their personal involvement, interaction and communications the researcher is then able to develop an in-depth understanding of what social processes, causal variables and/or explanatory factors are involved in the phenomena, and in effect determine the social meaning/s held within it (Miles & Huberman, 1994; Merriam, 2002). In this way the researcher themselves is seen as the primary instrument for data collection (Merriam, 2002). Of course a 'human' instrument carries innate shortcomings and bias that may impact the study, however, such bias and subjectivity can be monitored throughout the research process (Merriam, 2002) and through established analysis methods that can be followed to achieve validity in the categorisation of transcripts and the identification and development of themes and meaning (Miles & Huberman, 1994).

The data obtained through qualitative methods can be considered far more 'raw' and uncategorised than quantitative data. The data is most often in the form of words and interview transcripts, which require time to code and categorise in order to develop the meaning held within. However, the detail in the data obtained through qualitative research enables the description of social phenomena in great depths and essentially in the language of the research informant themselves (Merriam, 2002).

3.2.3 Exploratory research

Exploratory research seeks to generate *a posteriori* hypotheses from inductive investigation of a data set relating to a phenomenon (Stebbins, 2001). Such hypotheses describe how two or more variables are relating within the phenomena of interest, however, they make no attempt to provide universal answers to the research questions. The methodological restrictions relating to an exploratory approach are less stringent, making this a more flexible approach to adopt when no specific hypotheses exist beforehand and when working within social systems (Stebbins, 2001; Robson, 2002). This flexibility aligns with a pragmatic approach, and enables elaboration of a phenomenon in which little or nothing is known. Robson (2002) suggests that the quality of the research is related with the quality of the researcher and their personal skills, he

describes these as: having an open and enquiring mind; being a good listener; being able to adapt; having a general sensitivity and responsiveness to contradictory evidence; having a good grasp on the issue; and lacking in bias (or at least be able to identify it and manage it through out the research process).

Conventionally explorative research is often considered to be confined to the initial stages of a research endeavour, used to develop final definitions to a research study's questions or specific methodological procedures (Yin, 2009; 2012), however, this form of research need not be viewed as being limited to such application within a single study. Exploratory research can be carried out within the wider goal of accumulative knowledge, in that as a study in of itself it seeks to expand and develop current understanding and ideas around an (unknown or partially known) issue, topic, or phenomena. This then can make suggestions for further research, as well as provide insights valuable to the continued refinement and testing of hypothesis concerning the phenomena (Stebbins, 2001).

There are two overarching explorative endeavours within this study. The first involves the exploration of why some prepare and others do not when faced with a flood hazard in two contrasting case sites using PMT. The second involves the exploration of PMT (itself):

1. Within its applicability as an approach or method for the assessment of flood preparedness intentions; and
2. From the perspective of a deepening of understanding of the different concepts and processes making up PMT and how they are being utilized or expressed within the case sites to make decisions around preparing for a flood.

It is, however, acknowledged that the use of PMT and its associated concepts (Threat Appraisal, Coping Appraisal etc.) introduces aspects of explanatory thinking. The application of its concepts within the data analysis and coding processes present a set of a priori concepts and codes, generated independently of the experience and exploration of the author. This inherently

suggests a more top-down, deductive approach, and indeed to the extent that PMT is utilized as a framework in this research, aspects of explanatory and deductive reasoning will apply. Within the data analysis protocol the use of theoretically based themes (Braun & Clarke, 2006) selected from PMT and associated literature present the most significant aspects of this. However, this is not the dominant attitude guiding this research, and indeed the presence of top-down logic compliments the process. The top-down application of themes has been accompanied with a bottom-up (inductive) identification of additional themes from the data to enable a fuller exploration of the phenomenon and theory (PMT), and provide means by which richer analysis can be carried out. Table 3.2 presents a summary of the purposes, logics and applications within this study of exploratory and explanatory approaches.

Table 3.2 Summary of exploratory and explanatory approaches as utilised in this study

Approach	Exploratory	Explanatory
Purposes	• Finding out what is happening, especially in situations where little is known or understood; • Seeking new insights; • Asking questions of a phenomena; • Assessing phenomena in a new light; • Generating ideas and hypotheses for further research; Flexible design.	• Seeks an explanation of a situation or problem, traditionally but not necessarily in the form of causal relationships; • Explanation of patterns relating to a phenomenon; Identification of relationships existing between aspects of the phenomenon.
Associated logic or reasoning	• Inductive • Abductive	• Deductive
Place in study	• Overarching perspective & approach; • Use of PMT in case sites; • The broadening & elaboration of the concepts & processes of PMT (qualitatively); • The deepening of understanding around the applicability of PMT in the assessment of preparedness intentions.	• The use of PMT as a guiding framework; • The use of PMT in providing explanation for preparedness intention variations; • The use of a priori concepts & thematic codes in the data analysis & coding;

(Source: adapted from Robson, 2002)

To date, the explanatory ability of PMT has been limited by its restricted use within deductive, quantitative studies. As such this research is interested in more than just the explanatory and deductive power of PMT. It endeavours to deepen the understanding of the concepts and processes within PMT and

thereby broaden and elaborate on its design and applicability through a qualitative exploration of it, its concepts and its processes within two contrasting case sites.

3.2.4 Case Study research

Yin (2009, pp. 18) defines a case study as "*an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*". The environment created by the interaction of society and economy in urban centres is a complex system of social and environmental interactions, and as such one in which it is arguable that 'the boundaries between the phenomenon and context are not clearly evident'. For this reason it was not consider viable to simply use experimental or psycho-metric survey methods (Saunders et al., 2012); in-depth investigation of the PMT component concepts as they are active within real-world contexts, inclusive of all the characteristics of socio-environmental systems is needed. To achieve such an investigation a case study methodological strategy was deemed necessary, and pragmatically relevant.

Case study as a research approach receives mixed opinions from the academic world, with much debate surrounding its use and applicability to the generation of knowledge (Stake, 1978; Flyvberg, 2006; Yin, 2009; Tight, 2010). Indeed there exist numerous [mis-] understandings concerning case studies, which ultimately limit the credibility of the approach within scientific inquiries (Stake, 1978; Flyvberg, 2006). Essentially the credibility of case studies is limited by views concerning theory (more useful in generating hypotheses, than in the testing of them), reliability (lack of generalisability), and validity (contains a bias towards the researcher's preconceived notions) (Flyvberg, 2006; Yin, 2009). In addition the data collection for case study research can be time-consuming and tedious, which most often leads to large data sets (Darke et al., 1998; Yin, 2009).

However, despite his opinions on the expansionist nature and idiosyncratic focus of case studies, Stake (1978) views case studies as being ideal for

investigations that seek to add to existing experience and humanistic understandings, while being limited in their ability to present pervasive, experimentally determined results. It is within this view of the research approach that the current study drops anchor. However, the perceived limitations as they relate to issues of reliability and validity are acknowledged and appropriate measures undertaken to decrease any impact to these important research attributes. Figure 3.3 present the case study research framework developed for this study.

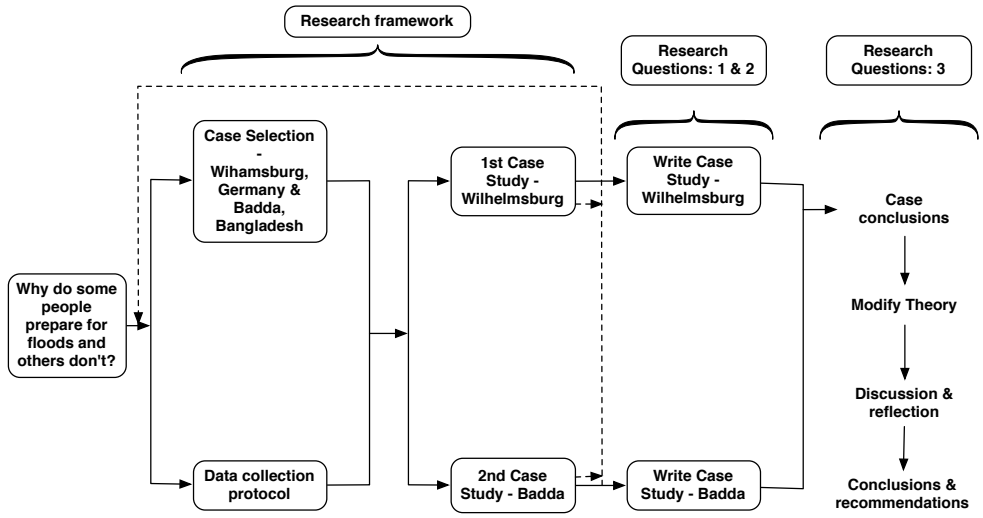


Figure 3.3 Case Study Research Framework for this study

3.2.5 Case definition & context: Future-flood-risk-urban communities

The 'case' is fundamentally the unit of analysis making up a case study (Yin, 2009). It can be a place, organisation, person, event, process, situation or attribute of any of these (e.g. the economy of a country, human resource department in a business, an amputee etc.), however, what is important to consider is that a case always '*occurs in a specified social and physical setting*' (Robson, 2002, pp. 179). Cases cannot be studied devoid of their context (Robson, 2002; Yin 2009, 2012).

As a flexible, methodological approach case study research can find the definition of the unit of analysis (case/s) shifting as the research itself develops (Yin, 2009). Indeed this in part was seen to occur within this study. Initially entire cities (with a flood risk) were considered as viable units for analysis. This

was done because of research commitments to the CORFU (Collaborative research on flood resilience in urban areas) project (EC 7th Framework - research sponsor). This research was part of a larger EC project looking at improving flood resilience in urban areas, it's design involved eight participating cities situated in Europe (Hamburg, Barcelona, Nice) and Asia (Beijing, Dhaka, Mumbai, Seoul, Taipei) - therefore, selection of cases was confined to one or more of these cities. In addition, research of these cases was done holistically and looked at modelling flooding and flood damages in as much of the vulnerable areas of the city as possible. However, from a practical and social perspective doing a case study that explores why some people are preparing for floods and some are not in an entire city is too broad a field, and would require teams of people. It was also impractical and not relevant to look at any communities within these cities that did not live in areas where there wasn't a future-flood risk, or where this future risk was not substantiated by a historical incident of flooding in the area. As such the unit of analysis for this study shifted from a view of a city as the unit of analysis to communities within vulnerable regions of the city. Vulnerable regions were defined by both their future-risk and historical flooding attributes.

The 'community study' as described by Robson (2002) was selected as the type of case study undertaken. This author defines this type of case study as involving '*a study of one or more local communities*' (Robson, 2002, pp. 181). Here this is taken to mean that the units of analysis of this study are different urban communities with the shared attribute of future-risk of flooding and historic incident of flooding.

Because of the fact that within shared levels of future-flood risk it has been observed that levels of vulnerability will vary based on access to wealth and resources (Few, 2003; Schneiderbauer & Ehrlich, 2004; Wisner et al., 2004), physical and psychological ability and health (Pelling, 2003; Wisner et al., 2004), gender (Fothergill, 1996, Gustafson, 1998), ethnicity (Fothergill et al., 1999), awareness (Andjelkovix, 2001; Jha et al., 2012) and experience (Siegrist & Gutscher, 2008). There is a differentiation to be made between future-flood-risk communities and shared-vulnerability communities. The later can be seen

to denote the capacity these communities have to protect themselves and or recover from the impacts of a flood event, and the prior relates to degrees of exposure to events. However, it is assumed within this research that future-flood-risk communities are constituted by shared-vulnerability communities (Figure 3.4) and as such from the exploration of future-flood-risk communities, attributes of the shared-vulnerability communities will emerge.

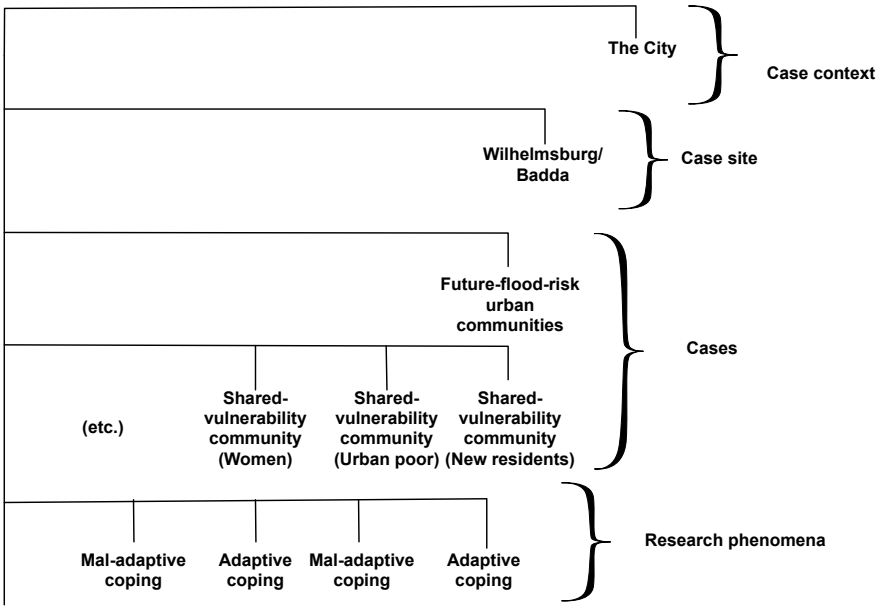


Figure 3.4 Breakdown of case study research units.

Box 3.1 Provides points that occurred within the undertaking of the research that influenced which communities were included. Because of these points, the case sites (in Germany & Bangladesh) in which cases were investigated did not have like representation of shared-vulnerability communities - which may be considered as one of the potential limitations to this study.

Box 3.1 Points that influenced shared-vulnerability communities evident in the cases (future-flood-risk communities).

- Willingness or availability of community members to participate;
- Accessibility to community members;
- Health and safety considerations in working with community members.

Case context and case site selection

The cities of Hamburg in Germany and Dhaka in Bangladesh were selected as case contexts for this study. The two contexts can be consider to be: socio-economic extremes; deal with different risk characteristics in terms of flood probability, frequency, magnitude, and duration; have distinct cultural

environments; distinct variations in politics and social organization; varying adaptive or coping strategies to flooding; and distinct mitigation measures and flood risk management philosophies. However, both cities are at risk from future floods, have a history of flood disaster and both cities represent socio-economic hubs for their respective countries - and as such view private flood adaptations as important to the long-term resilience of their cities. The contrasts between the characteristics of these two case contexts makes them well placed to explore the phenomenon of why some people prepare for future floods and others do not. Additionally, up till now PMT has only been applied in western European contexts, and no application of PMT could be found within the context of a developing country, nor within a context where flooding is a more frequent event. In improving understanding around the concepts making up PMT, it is important that the theory be applied within a high frequency, low resources, low-reliance on public protection context. In addition, the inclusion of a high-flood frequency case context, allows for better exploration of the role of experience in influencing the different concepts. Hamburg, therefore, is a context that allows for the alignment with other PMT studies in flood preparedness, and Dhaka as a contrasting case in which no PMT research has been undertaken.

Several other criteria were considered necessary in selecting the case contexts; these are listed in Table 3.3. The selection criteria have both theoretical and practical basis, however, due to the challenges posed in working in both cities, most especially the lack of language skills, emphasis was placed on accessibility and research support. An additional important consideration was that due to the source of funding, the case contexts had to be in contexts being looked at in the CORFU Project.

Table 3.3 Case context selection criteria

Theoretical criteria
• Be good contrasts of each other in terms of contextual variables (i.e. socio-economic situation, social and political organisation, culture); • Be good contrasts in terms of flooding frequency and flood defence; • Be good contrast in terms of social adaptive & coping behaviour related to flood damage mitigation and preparedness; • Have a history of flooding.
Practical criteria
• One of the CORFU case studies. • As such it can be assumed that they are: o A city; o Have the threat of flooding or the future threat of flooding (i.e. climate change); o Be in either Europe or Asia; o Have participating institutions & associated resources. • Be easily accessible: o Have the potential to provide strong research support and guidance. o Not present any political limitation or blockages in regards to data and access to informants & documents.

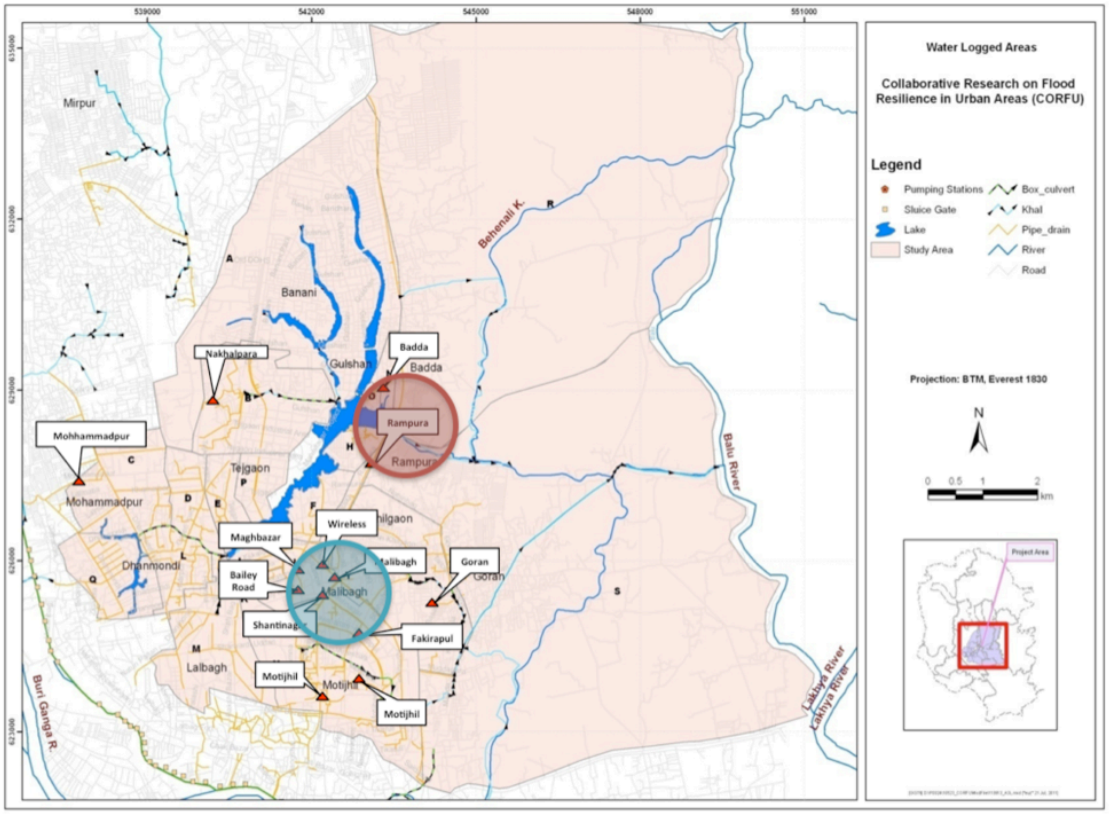
Due to the size and extent of the cities, as well as the variability in flood exposure of different areas of the cities it was necessary to select focus areas, here referred to as the 'case site', within each city. In Hamburg, the river-island of Wilhelmsburg was selected as the case site, Figure 3.5 shows Wilhelmsburg in Hamburg. Reasons for selecting this island include:

- It has a high risk to flooding from storm surges (from the North Sea) and the Elba.
- Has a history of flooding - in the 1962 floods, the entire island was inundated and 314 people died.
- With climate change the risk of higher flood levels (from storm surges and flooding) is predicted to increase.
- Extensive research into the area has been undertaken in regards to flooding (flood models, maps etc., available).

(Source: Wikipedia: 'Boroughs and quarters of Hamburg')

Figure 3.5 The Elbe River Island: Wilhelmsburg (part of the Mitte district, red circle), and its location in the City (and state) of Hamburg.

In Dhaka City, [south] Badda an area in the east of the city, where flood exposure is high from pluvial, urban and fluvial sources, was selected as the case site. Badda is situated near the eastern outskirts of the city and as such is located in the midst of some of the most rapidly developing regions of Dhaka City and falls outside of the main western flood defence. Two areas were initially selected to focus on in the city, one to represent an area on the east side still exposed to fluvial floods from the Balu River - Badda, and one to represent an area where water logging due to poor drainage is experienced - Shantinagar (Figure 3.6). However, due to access difficulties in Shantinagar during fieldwork only one interview could be done in this area, and as such this area has not been included in the study.



(Source: IWM CORFU outputs)

Figure 3.6 Focus areas selected in Dhaka City. Red = Badda & Blue = Shantinagar.

Previous experience in the case contexts

Table 3.4 provides a list of the author's previous experience with the two case sites, and identified strengths and challenges this experience or lack thereof brings to the study. Lack of experience in an environment does bring with it a wider spectrum of unknowns, and this was identified and investigated prior to fieldwork being undertaken through a risk assessment.

Table 3.4 The author's previous experience with the case contexts/sites and identified strengths and challenges this experience or lack thereof bring to the study.

Case Context	Previous Experience	Strengths	Challenges
Hamburg - Wilhelmsburg	• Have German roots, family comes from Hamburg; • Have lived in Hamburg for 6 months previously.	• Rough understanding of spoken & written German; • Previous experience of the culture & brought up by a German parent; • Knowledge of city & its layout; • Ease of getting around & access to a car if needed; • Support from family & friends.	• Language: need a translator; • Haven't spent time in Wilhelmsburg previously; • Informants may not wish to talk to an outsider.
Dhaka - Badda	• None in Dhaka! • Have grown up in developing countries [cultures], however these were in Africa; • Have worked with poor [African] communities in the past; • Am well travelled.	• Broad understanding of the issues active in developing countries (e.g. poverty); • Am sensitive to the voice of other cultures & communities; • Enjoy travelling & getting to know new cultures.	• Language: need a translator; • Do not know the layout or dynamics of the city; • Islamic principles & views & reception of woman; • Ability to get around limited & restricted; • Political instabilities of the country - local strikes ('*hartel*'); • Informants may not trust an outsider, or see them as a source of resources thus potentially biasing the interviews.

3.2.6 Conceptual framework: theoretical assumptions & definitions

Figure 3.7 presents the conceptual framework developed to guide the theoretical direction of this study. The framework is primarily based on Roger's (1983) version of PMT (Figure 2.3); it has been adapted here to include aspects of coping theory, and contextual components.

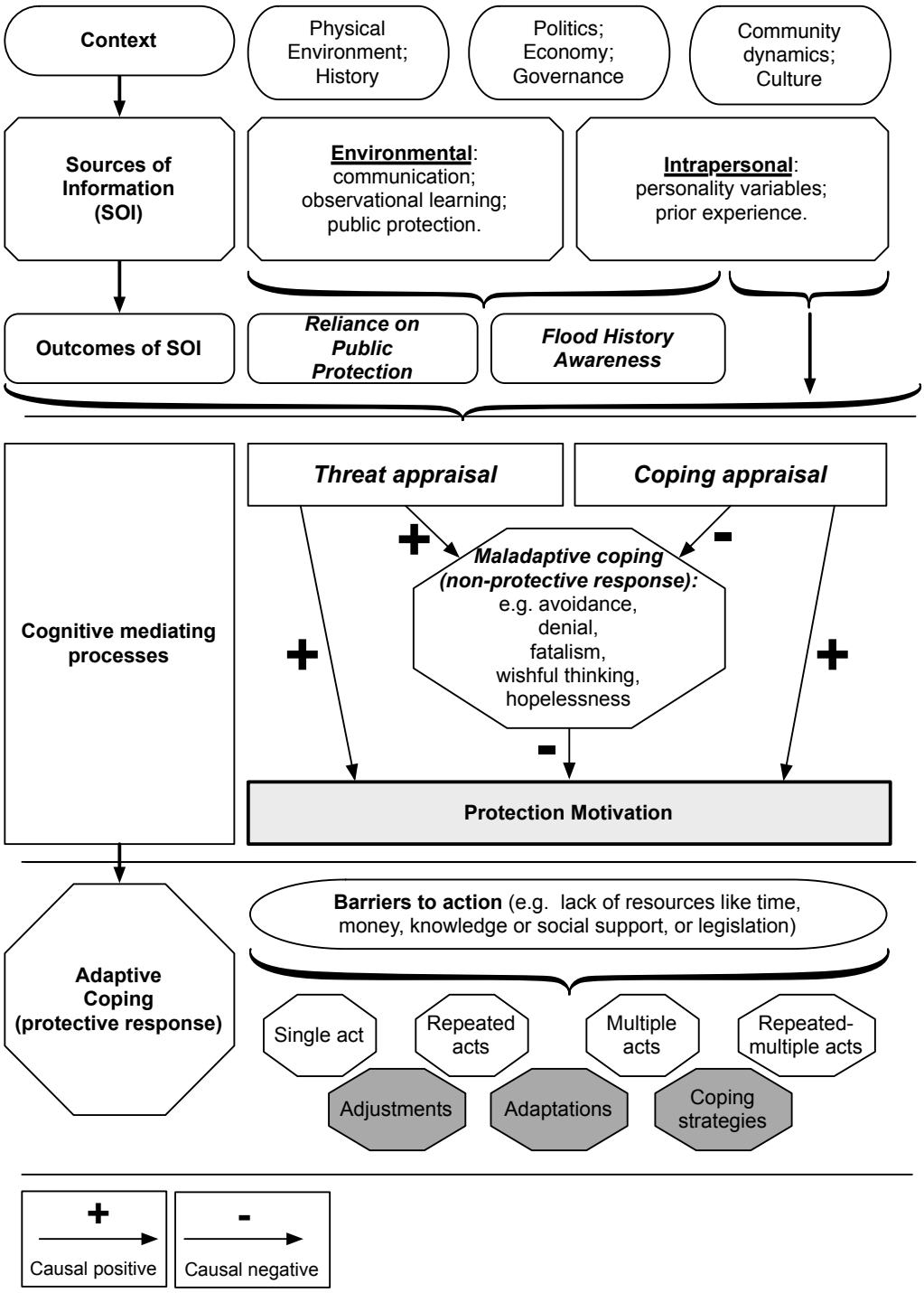


Figure 3.7 Conceptual framework

Roger's (1983) framework was selected, for two main reasons:

1. The inclusion of 'sources of information' provide context and influencing links with the cognitive processes of Threat Appraisal and Coping Appraisal that are absent from other PMT frameworks.

2. Some questions existed around the role of 'experience' in influencing the cognitive appraisal processes directly (i.e. risk perceptions or Threat Appraisal). Roger's inclusion of prior experience as an intrapersonal Source of Information (SOI) (Figure 3.7a) provided a more direct link between experience and the cognitive processes described by PMT as being involved in the assessment and appraisal of risk.

Grothmann & Reusswig's (2006) framework (Figure 2.4), therefore, differs from Roger's (1983) and the conceptual framework adapted and developed for this research, in two ways:

1. The concept of 'Threat Experience Appraisal' introduced by the authors, is not included in this study. This concept is described as the assessment of the severity of a past flood experience that people make. It is seen in their framework (Figure 2.4) as acting independently on protection motivation, with little (feedback) to no connection with or influence on the threat appraisal and coping appraisal processes. It also carries the implications of being an additional risk-related cognitive process. However, based on the literature reviewed around the potential influence of experience on risk perceptions and preparedness/coping behaviours directly, it was identified that people's appraisal of past experience was:
    - Not limited to an assessment of past event severity. And
    - Not justifiably separate from having a direct influence on the other cognitive appraisal processes.

- Given these points it was not sure as to how applicable 'Threat Experience Appraisal' would be in:
    - A high-flood frequency context like Dhaka. And
    - A methodological approach selected and developed to explore and deepen understanding about the different aspects and processes of PMT.
- Therefore, it was selected not to use 'Threat Experience Appraisal', but to separate it out into 'Prior Experience' and 'Flood History Awareness'. Where

'Prior Experience' is considered an intrapersonal source of information (Figure 3.7a), and relates to a person's previous experience with a flood event, or with an event that has similar characteristics to a flood emergency. This may have involved the use and employment of some form of coping response. 'Flood History Awareness' is here described as an 'outcome of the sources of information (SOI)', and reflects the knowledge and awareness people have of the flood history of their environment, this knowledge or awareness may have been generated from direct personal experience, and/or through the processing of information and messages available from their Sources of Information (SOI). In this way 'outcomes of SOI' will intuitively have aspects of cognitive processing behind them, be these related to the processing of personal memories, or from the processing of information. However, they are here differentiated from the cognitive processes explicitly being linked to the appraisal or assessment of a risk and coping responses. They are considered to be utilised and/or have an influence on these risk-related cognitive processes, but in of themselves be separate processes not explicitly linked to risk processing.

2. The second point of difference relates to 'Reliance on public flood protection'. Grothmann & Reusswig's (2006) include this as a variable or process like 'Threat Experience Appraisal' separate of the other cognitive processes, and having a direct influence on protection motivation. However, as the conceptual framework considers the acts and structures of public protection to be SOI (i.e. environmental SOI) (Figure 3.7a), 'reliance' on public flood protection is seen to be again an outcome of SOI (Figure 3.7). Again some degree of cognitive processing will have occurred involving both environmental and intrapersonal (I.e. personal characteristics) SOI to develop an either conscious (self-aware) or unconscious reliance on the city or State to protect them from floods; and like Flood History Awareness this is considered to be utilised and/or have an influence on the risk-related cognitive processes, but in of themselves be separate processes not explicitly linked to risk processing.

Apart from these, Grothmann & Reusswig's (2006) description of the other concepts and relationships between them have been maintained and included in description of the concepts as utilized in this study (Table 2.2).

Figure 3.7a presents the break down of the Sources of Information (SOI). Although, in this thesis SOI is used to represent all of the different levels (e.g. environmental down to community interactions or media messages), these are in fact all linked to just two collections of sources of information: environmental and intrapersonal (Rogers, 1983). Here 'source' explicitly refers to the source of the information, relative to whether it originates external to the person (i.e. environment) or from internal aspects (i.e. intrapersonal).

Environmental sources of information are based on the manner in which the information is obtained. Verbal persuasion denotes information conveyed to people by people; this can be in the form of community interactions (i.e. from friends, family, neighbours), organisational interactions (i.e. from police, government agents, NGOs), and/or media messages (i.e. internet, films, documentaries, newspapers, magazines). Media messages can be confusing as they really denote mediums used to send messages, however, whether the actual source is identifiable by a person or not, these mediums become sources of information to the people receiving their messages or using them to obtain information irrespective of their knowledge of the actual sources; from this perspective they are seen as a 'source' of information (to informants) in the environment. Alternatively to verbal sources, another group of environmental sources of information are those sources that are observed by the person themselves. These Rogers (1983) refers to as points of 'observational learning'. These include: witnessing others being affected by floods; being surrounded by evidence of past flood events (e.g. flood debris, damage, evidence), or memorabilia of past events (e.g. flood marks) and victims and damages of it; and having evidence of flood defence measures near their homes or places of work (or the construction of them by the city or their neighbours). Here the 'source' of information about flooding is one that is received and learnt through life lived in a specific culture and context. Because

the two environmental SOI do represent two different ways in which information about potential flood risk is conveyed, the findings chapters utilize ‘source of interaction’ and ‘sources of learning’ in discussing them.

The other group of sources of information described by Rogers (1983) is intrapersonal. This is made up of the information a person gets from his or her own personality characteristics (i.e. tendency to worry, stress; ability to trust etc.), as well as their own prior experience with flooding. The ‘source’ referred to here relates to the person himself or herself, and the information they have will be unique to them and their own processing of it.

The message or messages being received through the sources of information, and explored within this study have been specifically isolated to flooding, flood risk, flood preparedness and flood history. As such they are those aspects of their environment or self that provide cues regarding potential flood threats and potential responses to these threats. In this way they are assumed to be utilized by the person in their cognitive appraisal of the threat and coping options (Table 3.5).

Table 3.5 lists the main concepts being explored in this study, through the conceptual framework. Based on these concepts several case analysis points were identified. These points guide the collection of data about the concepts as active in the different case sites. Table 3.5 shows these points as well as the data sources used in building the data sets related to them, and the analysis activities relating to them.

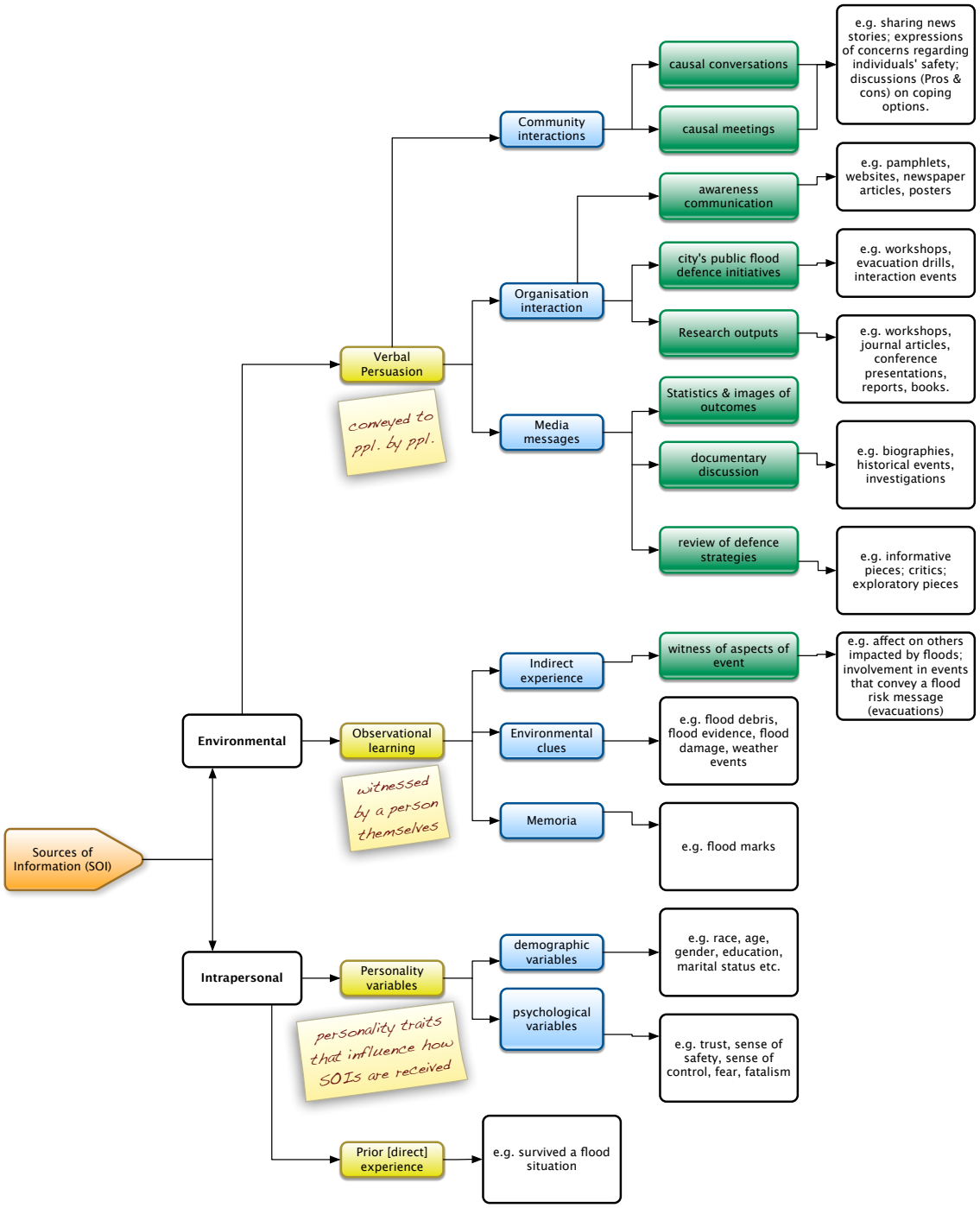


Figure 3.7a Source of Information framework

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Table 3.5 Key concepts and case study exploration and analysis points.

Aspects of conceptual framework	Concepts (highlighted) & Case analysis points	Data sources	Data analysis	Outcomes

Context	• Culture;
	• Politics & economy;
	• Socio-cultural history & characteristics;
	• Flood history;
	• Flood threat;
	• Flood Protection;
	• Flood Authorities.
		• Documents;
		• Interviews;
		• Observations.
			• Review;
			• Content analysis.
				• Describe case site situation;
				  ○ Identify key social influences active in case site;
				  ○ Identify key physical influences active in the case site.

Environmental & Intrapersonal SOI (Figure A.1, Appendix A)	**Intrapersonal**:
	• *Personality & dispositional variables:*
	  ○ Sample characteristics;
	  ○ Community dynamics;
	  ○ Experience of place;
	  ○ Experience of people.
	• *Prior Experience:*
	  ○ Direct vs. indirect
	  ○ Results of.
		• Documents;
		• Interviews;
		• Observations.
			• Review literature relating to key descriptions.	• Identify & describe the intrapersonal variables of the cases.
				• Provide some indications of how these stand to be influencing flood perception & behaviour.
				• Where applicable (or identifiable) describe how these are influencing flood history awareness & reliance in public protection.

	Environmental:
	• *Verbal persuasion:*
	  ○ Awareness [risk] Communication;
	  ○ Media.
	• *Observational learning:*
	  ○ Environmental signs:
	  ▪ Historical signs;
	  ▪ Weather;
	  ▪ Flood evidence;
	  ▪ Social signs:
		• Documents;
		• Interviews;
		• Observations.
			• Thematic analysis (themes based on diff sources of info.)	• Identify & describe the environmental SOI regarding flood risk in each case site.
				• Describe how residents are interpreting these.
				• Where applicable (or identifiable) describe how these are influencing flood history awareness & reliance in public protection.

	Outcomes of SOI: • Historical awareness of floods;	• Interviews.	• Thematic analysis (themes based on	• Identify how informants' have interpreted and/or engaged with

Aspects of conceptual framework	Concepts (highlighted) & Case analysis points	Data sources	Data analysis	Outcomes

	• Perceptions on public flood protection:
	  ○ Responsibility;
	  ○ Reliability;
	  ○ Trust (sense of safety).
			diff sources of info.);
			• Domain analysis for historical awareness in Wilhelmsburg context.
				the SOI in their contexts.

Cognitive Mediating Processes	**Threat appraisal (risk perceptions):** • Severity; • Likelihood; • Fear (affect variables). • **Coping appraisal:** • Self-efficacy; • Response's efficiency; Costs.	• Interviews; • Observations.	• Thematic analysis (themes based on diff appraisal processes).	• Describe how the different cases appraise their threat and coping ability. • Determine & describe the degree of protection motivation amongst informants.
Coping responses	• Non-protective responses; • Protective responses.	• Interviews; • Observations.	• Thematic analysis (themes based on diff coping processes)	• Identify reported coping responses. • Describe how non-protective responses are being employed and identify which are being used, by the different cases. • Explore the effects of the flood risk on reported & identified coping responses.

3.2.7 Timescale

Cross-sectional research is that which limits its investigation to one point in time, and the exploration of its' unit of analysis as it exists at that point in time (Saunders et al., 2012). As such changes in explored concepts with time are not considered or investigated. A longitudinal study of these concepts is recommended in future research, and acknowledged to be an important part in increasing understanding around people's flood behaviour. However, a long-term study of these phenomena was outside the scope of the resources and time available. As this study is aimed at building on the understanding around why some prepare and others do not, this timescale does not affect the aim of this study.

Implications of this timescale for the research include:

- Findings are relative to the time of interview and observation. Where possible additional trips to Hamburg were carried out but only minor observations made.
- Theoretical applications are suggestions made relative to the findings, as such these lack research into how they may change with time, events, new risk communication strategies.

3.3 Data Collection Protocol

A key characteristic of case study research is the use of multiple methods of data and evidence collection; Yin (2009) considers this a major strength of adopting this approach (methods triangulation). Multiple methods of data collection are also seen to enable a case study investigation to address a broader range of historical and behavioural issues (Yin, 2009). However, perhaps the most advantageous outcome is the ability to develop '*converging lines of inquiry*' through the process of triangulation (Yin, 2009, pp. 115). This study's data collection protocol utilises three data collection methods. The primary data source was semi-structured, in-depth interviews developed around Spradley's (1979) book, 'The Ethnographic Interview'. The secondary sources included data from academic and grey literature (where accessible), and

observations taken (recorded through field notes and photographs) while in the case sites. Development of the latter was guided by Spradley's (1980) book on participant observations. Figure 3.8 presents the data collection protocol and its links to other aspects of the research process, and Table 3.6 presents a summary of the strengths and weaknesses of the data sources utilised in this study.

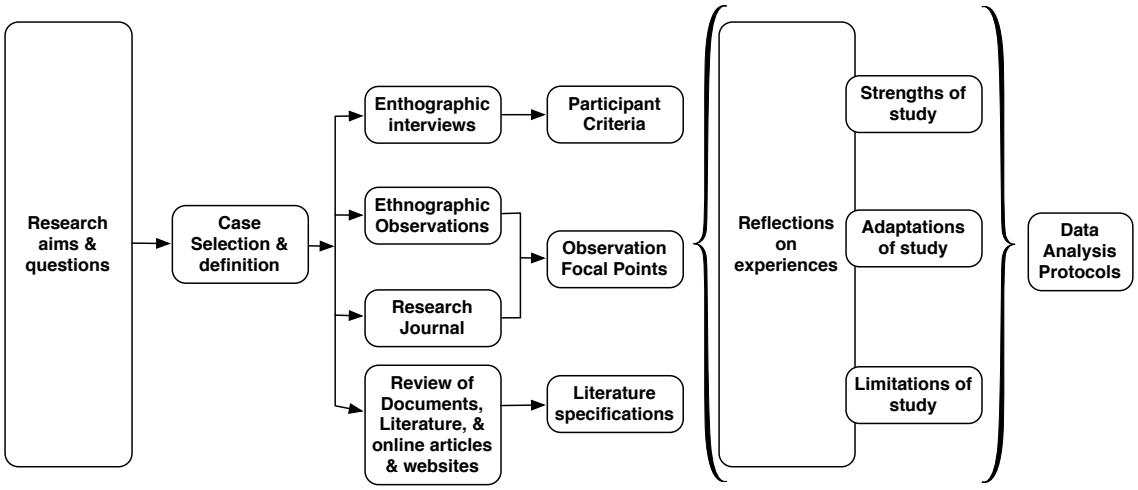


Figure 3.8 Data Collection Protocol

Table 3.6 Strengths and Weaknesses of selected data sources.

Source of evidence	Strengths	Weaknesses
Documentation (e.g. Academic literature, grey literature, e-literature)	• Stable - can be reviewed repeatedly; • Unobtrusive - not created as a result of the case study; • Exact - contains exact names, references, and details of an event; • Broad coverage - long span of time, many events, and many settings.	• Retrievability - can be difficult to find; • Biases selectivity, if collection is incomplete; • Reporting bias - reflects (unknown) bias of author; • Access - may be deliberately withheld; • Language - may only be available in language specific to case.
Ethnographic Observations	• Reality- covers events in real time; • Contextual - covers context of case.	• Time consuming; • Selectivity - broad coverage difficult without a team of observers; • Reflexivity - interviewee gives what interviewer wants to hear; • Timing - event of interest may not occur during time of research.
Informant Interviews	• Targeted - focuses directly on case study topics; • Insightful - provides perceived	• Bias due to poorly articulated questions; • Response bias;

Source of evidence	Strengths	Weaknesses
	causal inferences and explanations.	• Inaccuracies due to poor recall; • Reflexivity - interviewee gives what interviewer wants to hear.

(Source: adapted from Spradley, 1979; Spradley, 1980; Yin, 2009)

3.3.1 Documents & Literature

Most case study investigations will utilise to some degree or another documents in their investigation (Robson, 2002; Yin, 2009). Documents represent a useful social artifact that enables the researcher to expand and direct their investigation in an unobtrusive and non-reactive manner (Robson, 2002). By this is meant that documents concerning cases and their contexts provide information that does not require direct interaction with someone. As such there is little chance of behaviour or responses being influenced by the social elements that exist in interviews (Robson, 2002). It is good to remember, however, that documents are evidence that may have been contracted with differing purposes than the researcher wishes to use them for. Therefore, documents can be considered useful, but not always accurate or without bias (Yin, 2009). Indeed in case studies Yin (2009) suggests that the role of documents is to corroborate and augment evidence from other sources. Robson (2002), suggests a similar thing, and puts forward that one of the advantages of documents as data is that they can provide valuable cross-validation of other measures. However, both authors are critical of an over reliance on documents in case studies, and advocate taking time to appreciate the specific purpose and specific audience the document was intended for. In addition, Yin (2009) identifies that a newer problem that now exists with the use of documents now involves the abundance of materials made available through the Internet. This abundance may cost the researcher valuable time, as they may get lost in the review of it. Having abundant data is not necessarily a negative thing, however, the responsibility lies with the researcher to maintain a strong sense of their case study focus and restrict themselves to pertinent information that most effectively enables them to achieve their objectives (Yin,

2009). Table 3.7 lists the documentary evidence used in this study as well as the parts of the conceptual framework it was used to explore and describe.

Table 3.7 Documentary sources utilised and part of conceptual framework they were applied to.

Documentary sources	Conceptual framework
Historical information on floods in the case contexts (inclusive of visual documents e.g. movies & documentaries);	• Context; • SOI.
Formal studies or evaluations of the cases and case sites (inclusive of academic studies);	• Context; • SOI; • Cognitive mediating processes; • Coping responses.
Government plans, policies and reports concerning flooding & flood defence in the case contexts;	• Context; • SOI; • Barriers to actions (e.g. flood insurance availability); • Coping options (coping appraisal).
NGO and relief organisation reports, articles and websites;	• Context; • SOI; • Coping responses.
Mass media and community (case specific) newspaper, magazine & online articles, films, documentaries, photographs.	• Context; • SOI; • Cognitive mediating processes (where available; • Coping responses.

It is important to note here, that one of the limitations of this study was that the author has only a rough understanding of spoken German, and no ability in Bengali; therefore, she was limited in some of the documents she could readily access. Where deemed import documents or sections of documents were sent off for translation, or the research organisations providing support in the case context were asked to provide assistance with translation. However, translation of materials always carries the risk of loss of meaning or even scope. As much as possible documents that were available in English were used, but it is acknowledged that the issue of language did not allow for an extensive review of documentary evidence. This was especially true for government reports and community newspapers, magazines and articles.

3.3.2 Semi-ethnographic observations & interviews

Ethnographic approaches are a hallmark of cultural anthropologists, who work at describing a culture (Spradley, 1979; 1980). Such descriptions are based around the goal of understanding another's way of life from their view point;

essentially ethnography involves the study of '*what life is like to people who have learned to see, hear, speak, think, and act in ways that are different*' (Spradley, 1980, pp.3). Full ethnographic approaches usually are characterised by high investments of time in the field, living with or in the communities or cultures of interest (Robson, 2002). Such investment was not possible in this study, however, the approaches put forward by Spradley concerning ethnographic observations (1980) and interviews (1979), provide useful means for:

- Developing an understanding of a culture that is different from ones own (i.e. western vs. eastern cultures; developed world cultures vs. developing world cultures); and
- Collecting information that is culturally aware (and sensitive as far as possible given the time restrictions) with reduced or identified bias (relative to the researcher's views on life).

As such an ethnographic approach to fieldwork in the case sites was deemed advantageous to this study as it would:

- Provide tools and techniques that the researcher could use to develop an understanding of the new cultures and as such a better understanding of the context and the people in it;
- Enable the researcher to explore the effects future-risk or historical-incident of flooding has had on current cultural and social practices, and how these might in turn be influencing their responses to the risk of future floods;
- Provides points to use in identifying the influence of personal perceptions or views on observations and interviews;
- Provide established methods of undertaking observations and interviews that enable the broader search for meaning and understanding specific to informants and their environments or communities.

However, given the limitations in time this study had to undertake the two case context visits, the ethnographic processes developed by Spradley (1979, 1980) had to be adapted, and because of this the term 'semi-ethnographic' has been used to describe both the observations and interviews undertaken in this study.

Spradley (1980, pp. 5) identifies three points of exploration around human experience that are important to ethnographic approaches: '*what people do* (cultural behaviour)*, what people know* (cultural knowledge)*, and the things that people make and use* (cultural artifacts)'. To explore these in this study, unobtrusive [non-participatory] observations within the case sites and semi-structured interviews with members of urban communities in the case sites were undertaken. Both data collection methods employed are semi-ethnographic in nature.

Unobtrusive, semi-ethnographic Observations

Observations of people's actions and behaviours are a natural and often-obvious data source utilised within social science studies (Robson, 2002). *"People everywhere order their lives in terms of what things mean"* (Spradley, 1979, pp. 95). All cultural meaning is developed through the use of symbols, defined by Spradley (1979, pp. 95) as being '*any object or event that refers to something*' i.e. events, signs, language and things. These symbols do not hold meaning in themselves it is their relationship to other symbols which give them meaning (Spradley, 1979). Cultural meaning systems are collections of intricately interconnected and interacting systems of symbols utilised by people to make sense of their environments, relationships, actions, and conversations (Spradley, 1979). Such systems, therefore, present aspects of social processes that reveal local understandings around cultural behaviour, cultural knowledge, and cultural artifacts. To generate an understanding of meaning systems in an environment, a researcher needs to develop an understanding of the relationship of the symbols making up these systems.

In each case site observations were done to determine meaning systems behind the symbol of 'flood' and 'flood defence' as they are evident in the environment. These symbols were chosen because expression of them in the environment is believed to have an influence on local flood perceptions and preparedness consciousness. Table 3.8 lists the observation points utilised while in the case sites, and the points in the conceptual framework they worked to add to. Observations focused on aspects (behaviour, flood defences,

historical signs of flooding) that acted as SOI (Table 3.8). These SOI would be providing residents and communities with indications of the flood risk, its affects, and the defences (or coping mechanisms) against it, and most often be generated from local flood meaning systems.

Table 3.8 Observation points utilised to add to exploration of conceptual framework.

Observation points	Collection Method	Conceptual framework
• Environmental signs (cultural knowledge, cultural artifacts); • Historical signs & memorabilia (cultural knowledge, cultural artifacts); • Flood evidence; • Evident Flood defences/responses; • Cultural signs &/or artifacts of flood awareness/defence (cultural behaviour, cultural knowledge, cultural artifacts).	• Street walks (in focus areas); • Visits to local resident's homes; • Visit to flood defence sites; • Prolonged stays in case contexts (2 & 3 months).	• Context; • SOI; • Cognitive mediating processes; • Coping responses.

Unobtrusive observations are non-participatory and as such achieve a degree of non-reactiveness from the subject (Robson, 2002). Given that there was little scope for the researcher to be involved in any aspects of flood preparedness in either case site, and that during her time in the sites a flood did not take place, it was not possible to carry out any form of participatory observations.

In carrying out observations, Spradley's (1980) observation grid was utilised to guide the process. This grid is available in Appendix A (Figure A.3). Observations were carried out by taking street walks in the focus areas, visits to local residents' homes, and site visits to flood defence structures (Table 3.8). They were recorded either as written descriptions in a research journal, or as photographs (where possible) of flood related artifacts, actions, or evidence.

Semi-structured, semi-ethnographic Interviews

Interviews are another widely utilised method in social research (Robson, 2002; Yin, 2009). Questions were designed to be semi-structured and in-depth. It is more conventional in ethnographic interviews to select more open-ended

questions, as the objective is to get a deep discussion and discourse happening that enable later analysis of terminology and language use in reference to the selected topic and thereby establish the evidence for cultural connections (Spradley, 1979). Semi-structured, in-depth, interviews enabled:

- The interviews to be kept focused on concepts and themes.
- Concepts and themes to be explored extensively and with depth:
  - Confirms what is already known;
  - Provides new avenues for learning;
  - Provides reason behind answers given, not just answers.
- The interviews to be less intrusive by encouraging two-way communication between interviewer and informant.
- Provides more comfortable settings in which potentially sensitive (past flood experience) issues can be more easily discussed.

Interview guides & procedures

Interviews questions acted as guides (Boxes A.1 & A.2, Appendix A) to elicit information from informants on selected themes. Themes included:

- Informants' perceptions of flooding and flood risk;
- The need to prepare;
- Experience of flooding;
- Views on the job and involvement of state protection agencies.

The conceptual framework put forward by Grothmann & Reusswig (2006) was initially used as a guide to conceptual aspects ('threat appraisal', 'coping appraisal', and 'reliance on public flood protection') (Box 3.2). The concept 'threat experience appraisal' as mentioned previously was not included; instead the concept of 'prior experience' was included.

Box 3.2 Objectives of Interview guides

To elicit from informants [*Residents in vulnerable areas]* information on:
Threat appraisal - flood risk perception
a. *Perceived Probability* - perception of probability of flooding occurring and if it occurs, perceptions of personal exposure to it.
b. *Perceived Severity* - perception of severity of damage to neighbourhood, community, family, self.
c. *Emotive aspects* - feelings associated with flooding
Coping appraisal - Perceptions on ability to cope
a. *Protective response efficacy* - perception of efficiency of protective structures & measures to protect them and their families.
b. *Perceived self-efficacy* - perceptions of their own efficiency to implement protective measures or protect themselves and their families.
c. *Protective response costs* - perceptions around the assumed cost of taking the preventative response (i.e. financial, time, and personal effort).
d. *Perceived need to prepare* – perceptions around the need to prepare for flooding.
Prior experience – the use of prior experience in understanding and describing flood risk.
Reliance on public flood protection – inclusive of authorities & structural defences
a. Sense of personal responsibility to prepare.
b. Dependence on city authorities or external agents for protection.

As the interviews themselves were administered through or with the aid of a translator, it was not deemed necessary to translate the interview guides, which are developed to be adaptive to the interview process, relative to the informant's responses, comfort, behaviour and requests. Need of a translator is a potential limitation to the interview process, other limitations of the interview guides are presented in Box 3.3.

Box 3.3 Guide considerations & potential limitations

- Interviews done through an interpreter/translator - so interviewer not always able to control process;
- In-depth interviews require some time with informants, interview lengths put off the participations of some potential informants;
- Semi-structured questions mean that not all informants discussed the same questions
- Dhaka interviews did not have the input from previous knowledge of the area and people, so went through constant refinement during fieldwork process.

Sampling Procedures for informants

A non-probability sampling method was selected for identifying possible informants in Wilhelmsburg and Badda (Fink, 1995; Black, 1999). Snow-ball sampling entails letting one informant connect you to another; for this study, each interviewed informant was asked to give names and contact numbers of people in the case site they thought would be willing to participate. Black (1999) highlights a disadvantage of this way of sampling, in the lack of certainty the researcher can have over the representivity of the population. Advantages

of this technique were the provision of names and contact details that enabled the researcher to phone and make appointments and identify possible informants in an undefined population.

The initial aim had been to interview both affected residents (in a mixture of economic classes & building structures) and supporting authorities. However, interviews done with authorities[8] have not been included in the analysis as focus on residents' views and perceptions were later chosen to take priority. Elements from the interviews and discussions with authorities are included to build contextual understanding and/or explanations for a situation if relevant. Box 3.4 presents the list of eligibility criteria utilized in identifying possible informants.

Box 3.4 Informant Eligibility Criteria

- **Wilhelmsburg**:
  - Informant types:
    - Residents & workers in vulnerable areas.
  - Criteria for participation:
    - No one who cannot give legal consent to use the information provided, or undertake to do an interview without a guardian present (i.e. underage children, or adults whose disabilities diminish or influence their capacity to consent with full understanding of the process and request).
    - And currently works or lives in the focus area.
- **Dhaka City:**
  - Informant types:
    - Residents & workers in vulnerable areas (from varying economic & social classes).
  - Criteria for participation:
    - No one who cannot give legal consent to use the information provided, or undertake to do an interview without a guardian present (i.e. underage children, or adults whose disabilities diminish or influence their capacity to consent with full understanding of the process and request).
    - In this case study an additional consent process has been developed to enable illiterate or informants that can not understand or read English to give consent through a representative in the presence of a witness.
    - Unless previously known to author focus is on interviewing women.

In Wilhelmsburg selection was started with a list of previous participants who had participated in a workshop on flood awareness (provided by supporting

[8] In Hamburg, 10 representatives within the 'Behörde' responsible for flood defence were interviewed. However, in Dhaka it was not possible to get to speak to any government representatives; four representatives from local NGOs (ActionAid, Oxfam, FH, The Asia Foundation) who provide the majority of disaster emergency & risk reduction support were interviewed. However, it was established that these organisations (except for FH) did not have experience working with urban communities in Dhaka, only rural communities in Bangladesh. Due to the difficult in contacting these authorities, it was selected that it was best not to include interviews with authorities in the analysis process.

institute TUHH). This was a good way to start in order to pinpoint people and have places to start finding informants. Unfortunately it meant that the process started within what could be classified as the 'Interested German' community, interest here denoting interest in the issue of flooding for Wilhelmsburg. As it turned out this would become the primary community of focus for the research, as it proved difficult to find 'Interested non-Germans', or 'Non-interested Germans [or not]' who wanted to participate in the study. Three non-German participants, with varying degrees of interest in the topic of flooding, were interviewed. It is considered a limitation of the study that views from other members of ethnic and minority communities could not be obtained. Figure 3.9 indicates where in Wilhelmsburg the informants live.

Figure 3.9 Distribution of informants interviewed in Wilhelmsburg, Hamburg.

As the snow-ball did not 'roll' as expected, and the pool of possible informants filled and drained, other methods such as opportunist interviews and 'walking the streets', and asking local business people (mostly store owners) if they would be interested in participating, had to be applied. One German

restaurateur was identified this way, however, most others declined, many stating that they could not spare the time to do the interview. It had been hoped that this would be a means to identifying willing members of the Turkish community, but this did not turn out as desired. Two of the three non-German participants interviewed were identified from going to the Wilhelmsburg Bürgerhaus (Community Hall) and asking there if anyone would be willing to participate in doing an interview. One Turkish man agreed to the interview, and introduced the author to another Iranian man who also agreed to do an interview. Another source of contacts came from gathering public brochures on organisations, institutions and committees active in Wilhelmsburg and contacting[9] representatives to find out if they would be willing to do an interview at their connivance (date and time). Lastly informants were identified through familial networks of the author and her translator, these in turn helped to stimulate alternative 'snow-balls'. In total 30 interviews were achieved with residents living in the case site (44h30min of recorded discussion). Of these the first two acted as a pilot of the questions and interview guide. These interviews were used to check reliability and relevance of interview guides and questions. Based on these corrections and improvements were made to the interview guides:

- Interview guides shortened;
- Questions refined;
- Questions on views of responsibility of the city taken out.

The pilot interviews' responses were not included in the main coding and analysis of the data. So findings are based on 28 interviews.

In Dhaka, one of the local NGOs contacted (Food for the Hungry - FH) had done previous work with some of the slum communities in Badda, and helped capacitate and encourage members of these communities to establish a local community-based organisation (*Sochesta*) that worked at providing services like the distribution of resources (medicines and food) during flood periods, as well

[9] Via the contact details they provided on these public pamphlets

as other forms of support during none-flood periods. FH provided [trusted] introduction to this organisation and their chairman, who in turn helped in identifying and introducing the author to other informants. Ten in-depth semi-structured (11h19min recorded discussion) interviews with lower-income residents (urban poor communities, slum areas) in Badda (Dhaka) were achieved. Figure 3.10 indicates where in Badda the informants live.

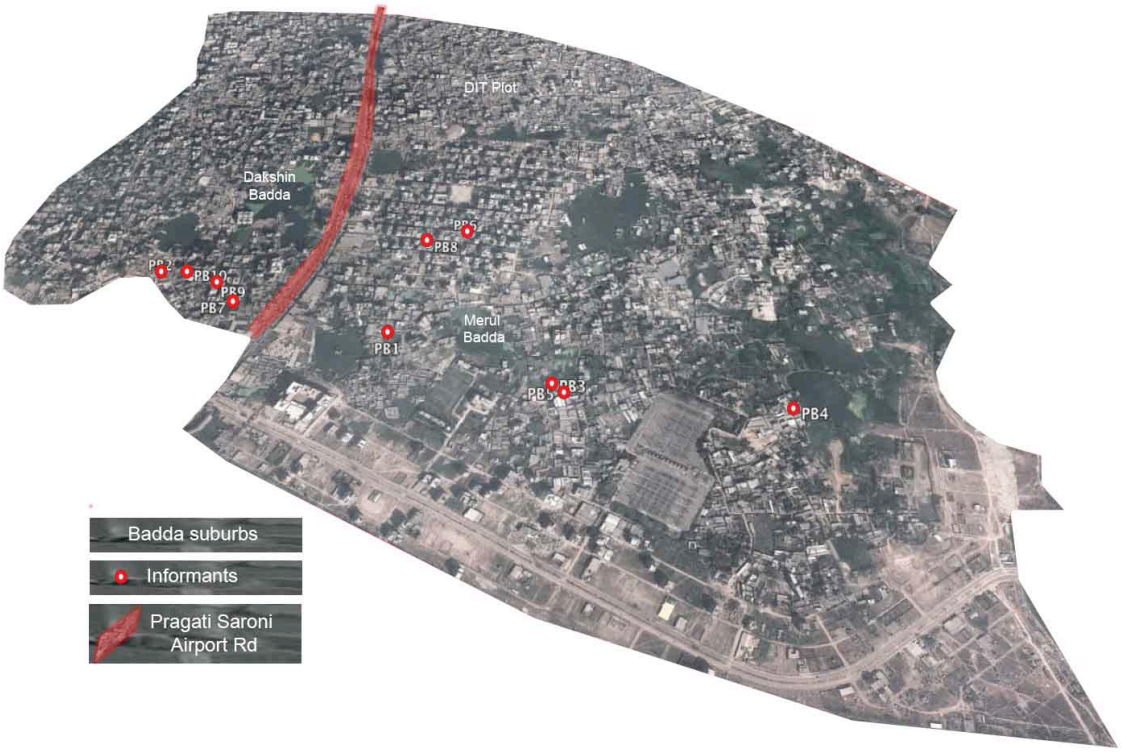


Figure 3.10 Distribution of informants interviewed in Badda, Dhaka City

Due to actions by male informants that made the author uncomfortable during interview conditions (i.e. sexual overtures), it was deemed best not to interview men from lower-income settings. This meant that all the interviews done in Badda were with women. This is not entirely considered a limitation of the study, as research has shown, and it was observable in the field, that the people chiefly responsible for preparing households for future-floods, is the women of the house (Fothergill, 1996).

Due to access issues, carrying out interviews with informants from different income classes proved to be difficult. This means that there is one informant

group in the Dhaka sample, that of the urban-poor[10] women living in south Badda. Two interviews with woman from middle-income circumstances were done, however, one could not be included in the study as her husband came home and took over the interview, changing the tone and breaking its flow. Given this it was selected not to include these interviews in the final analysis. In addition to these, three group discussions with villages in Sirajganj (north-west of Dhaka) on the banks of the Jamuna River, and with teachers and principles from local schools in the Sirajganj area were carried out. These interviews although not included in the final analysis helped give depth of understanding to the experience of flooding in the rural areas to compare with what was discussed about flooding in Dhaka City.

Because of the challenges working in Dhaka (transport, gender sensitivities, politic unrests), carrying out defined pilot interviews were not possible. Instead the author spent time talking to other expats who had extensive experience working with lower-income Bangladeshi communities. These discussions helped guide the author in structuring the interview guides and questions to be more culturally relevant, and better illicit discussion and information from informants. An important suggestion made to the author was to avoid using categorical questions and from introducing herself from the perspective of where she was from, where she was studying and what degree she was studying (which are more conventional introductory mechanisms in western cultures). Categorical questions do not illicit discussion and put Bangladeshi people in a position where they are looking for the right or wrong answer. As culturally they do not like to look wrong, these types of questions make people uncomfortable and open the way for bias due to informants trying to keep face. Alternatively, a more relational perspective was taken, this involved introducing

[10] The 'urban-poor' are those who are mostly rural migrants, living in the slum and informal settlements in the city. They reside in highly dense areas of the city, in poor-quality homes characteristically made of temporary materials (e.g. bamboo, mud, corrugated iron – kutcha) or more permanent, but often dilapidated buildings (e.g. semi-concrete, bricks, corrugated roofs – semi-pucca) (Rashid, 2000). Their home are often overcrowded (with three or more adults per room), and supplied by inadequate water supplies, poor sewage and drainage facilities, and unpaved roads or lanes leading to their homes (Rashid, 2000).

the author from the perspective of who she was in relation to others in her family and life, and who she was in relation to the informant (what she was asking of them, what she was trying to achieve from getting their help). The author took the guise of student, looking for teaching about flooding from the informants, questions were then asked more from the perspective of 'what can you teach me', as opposed to 'what do you think'. This change in perspective helped make informants feel more comfortable and provided deep discussion around the different topics.

3.3.3 Fieldwork & reflections on experience

In entirety two fieldwork trips were taken to Wilhelmsburg. The first in April 2011 was a two-week scoping visit; during this period the case site was identified and initial interviews with authorities and researchers (at partner institution TUHH) undertaken to broaden understanding of the context and situation, especially as it relates to flooding. A return visit was then planned and undertaken from September (25th) to November (27th) 2011. During this visit observations were undertaken in the case site and interviews done with informants.

One, three-month (Feb - May 2012) fieldwork visit was undertaken to Dhaka City, Bangladesh. Arriving in Dhaka was the start to one long experience of culture shock for the author, who having never visited South-East Asia before or been exposed to the culture of the region faced a significant learning curve that began the moment of departing from the plane. On hindsight it would have been a benefit to organise two field trips to Dhaka as was done in Wilhelmsburg. The first to allow for initial exposure and familiarisation with the situation, the culture, the opportunities, the issues, and provide time for the development of a support network. The second to undertake interviews and observations. The knowledge from the first trip could have fed more effectively into the development of interview guides and questioning techniques, which were more culturally sensitive and manageable. In addition, it would have enabled time to anticipate the impact of culture shock. As it is this was not possible and the three months spent in Dhaka City were marked with

continuous challenges and rapid-adaptation to interview structure, approach, timing, etc.

3.3.4 Recording, transcription and translation

All interviews were recorded, and the recordings passed on to a dual-language speaker, fluent in English and either German (for German case site) or Bengali (for Bangladesh case site). These people then transcribed the interviews in native language, and translated the transcriptions to English. Ideally it is recommended to use a translator who is native in the language being translated into, however, English-speakers fluent in these other languages are not as readily available, and if available charge significantly higher fees for the process.

Post transcription the author went through all transcripts to check that the transcript matched the original audio – (English parts, and some of the German). Reading through the transcripts also enabled the author to begin to identify underlying themes in this data source.

3.4 Data Analysis Protocol

The data analysis protocol for this study applies thematic analysis (TA) (Braun & Clarke, 2006; Guest et al., 2012) to the data in order to better explore the concepts. This is a qualitative data analysis technique that identifies, analyzes and explores themes within data (Braun & Clarke, 2006). Themes can be both explicit and implicit ideas within the data (Ryan & Bernard, 2003; Guest et al., 2012), and TA seeks to find repeated patterns of meaning in order to identify and describe these (Braun & Clarke, 2006).

Given the amount and type of data (qualitative, transcripts, observations, field journal, documents and literature) selecting a non-complex method of analysis was deemed favourable. Furthermore, given that opportunity to have other coders involved was not available it was considered important that the analysis method be as transparent as possible, to allow for the assessment of validity by the reader. Lastly, this study includes pragmatic thinking in its design, and as

such a few aspects need to be included in the selection of an analysis approach:

- Focus in on the research questions and the best way to address them.
- Provides a means by which concepts and associated themes receive meaning through their context.

TA represents a relatively non-complex method of data analysis (Braun & Clarke, 2006) with inherent theoretical flexibility (Clarke & Braun, 2013). In this way it suited the various theoretical and practical needs of this study. Other benefits of TA are listed in Box 3.5.

Box 3.5 Benefits of using Thematic Analysis.

- Is suited to a wide range of research interests and philosophical perspectives (e.g. realism and constructionist paradigms).
- It works with a wide range of research question.
- It can be used to analyze different types of data (e.g. media sources, focus groups, interviews).
- It works with large or small data sets.
- It can be applied to produce data-driven or theory-driven analyses.
- Deals with the data in detail.

(Source: Clarke & Braun, 2013)

Although, TA's flexibility is an advantage, it can also be a disadvantage:

- Can make development of guidelines for analysis difficult and as such confuse or limit the ability of a researcher to decide on what aspects of their data to focus on (Braun & Clarke, 2006).
- Although one of the most frequently utilised avenue of analysis of qualitative data, it is poorly documented and as such open to the skepticism of the science community (Braun & Clarke, 2006).

In addition, the interpretive strength of TA can be limited by the degree to which theory is utilized; Braun & Clarke (2006) suggest that grounding the analysis within a theoretical framework provides a strong interpretative method that can be used to make analytic and theoretical claims. In this study the theory of PMT provides this theoretical framework (Figure 3.7), and the core concepts making up this framework provide the basis for both the data collection and data analysis protocols. Analysis of these concepts sought to identify and explore associated themes and categories, to provide richer description and

interpretation of these concepts as expressed by informants during the interviews.

Figure 3.11 presents a diagram of the analysis protocol for this study; this has been based on (adapted from) Braun & Clarke's (2006) six phases of TA. The analysis protocol involved five steps: coding, identification of themes (and categories), refining of themes, describing and exploring themes, and exploration of influencing relationships between themes.

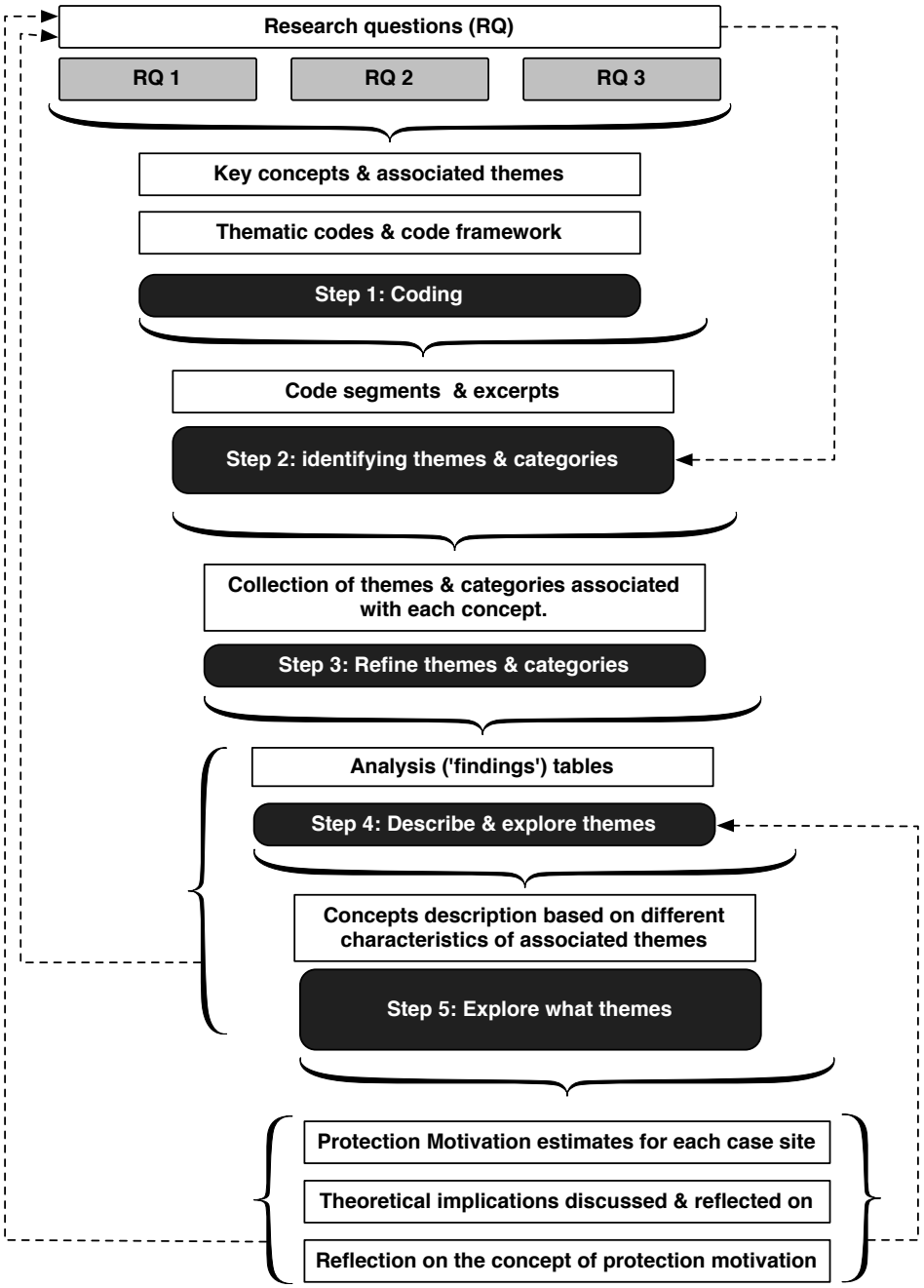


Figure 3.11 Data analysis protocol.

3.4.1 Five steps of analysis protocol

Coding

Coding in this study was done over three rounds, as shown in Figure 3.12, and undertaken using the online analysis site Dedoose (http://www.dedoose.com/). Each case site represented separate rounds of coding (i.e. Wilhelmsburg was coded separately from Badda), in this way the theme development could be sensitive to contextual influences (e.g. frequency of flooding).

The first round looked at structural codes, these are broad codes that look at chunks of text in the transcripts that relate to the same question, or section, or topic (Guest et al., 2012). Saldaña (2009) refers to holistic coding in regards to this type of coding. Structural or holistic coding is useful in ordering transcripts and/or larger units of text for coding relative to overall contents (Saldaña, 2009).

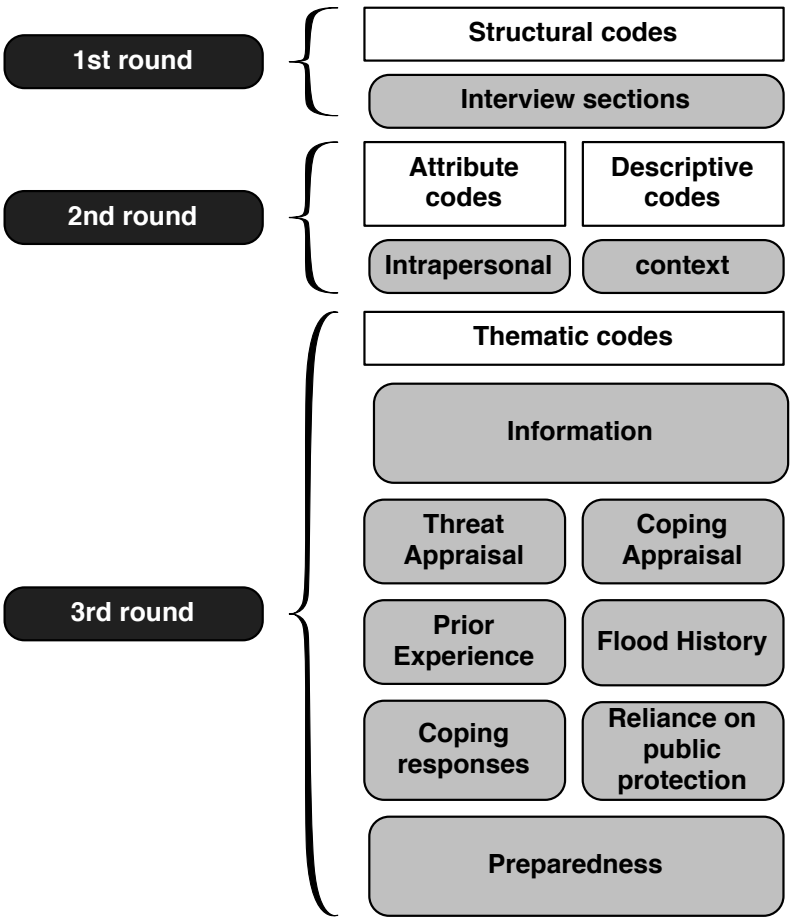


Figure 3.12 Coding rounds, grey elements indicate the key concepts used to guide codes and theme identification.

The second round of coding had two objectives:

- Identify key attribute points regarding the informants themselves (attribute codes, Miles & Huberman, 1994). These codes looked for characteristics of the informant like age, time lived in case site, marriage status, occupations, education etc. as well as any other aspects to do with informants that may have bearing on their views of risk, of flooding, of flood preparedness, flood response etc. Points included were informants' experience of place and of people in the place.
- Coding for descriptive points regarding informants' context (descriptive codes). Miles & Huberman (1994) describe descriptive codes as being similar to structural or holistic codes. These codes are focused on topic not content, where a topic is seen as what is being talked about, and content is the substance of the message (Saldaña, 2009). Here the topic being focused on was informants' contexts. Aspects coded for were: events in the context, cultural practices, active organisations, relationships between people, relationships between people and the case site (environment), things enjoyed about the context, concerns, observed changes in context, activities.

The third and main round of coding involved coding relative to the key concepts of: 'information'; 'flood history'; 'reliance on public protection'; 'prior experience'; 'threat appraisal'; 'coping appraisal'; 'coping responses'; 'preparedness'. Table 3.9 provides the lists of the codes for the key concept of 'threat appraisal' as an example. In this regard codes represent both semantic (surface meaning) and latent (identify *underlying* ideas, patterns, and assumptions) themes identified within the data. This round is here referred to as 'thematic coding/codes'.

Table 3.9 Codes and code description for the key concept 'threat appraisal'.

Key concept	Wilhelmsburg Codes	Description	Badda Codes	Description
Threat appraisal	Knowledge of current threat	Captures informants' understanding, knowledge, awareness of the flood risk.	Living with floods	Captures points informants raise that reflect attributes of life lived with floods.
	Causes for the threat	Informants' understanding of what causes the flood risk.	Causes for the threat	Informants' understanding of what causes the flood risk.
	Worry about flooding	Identifications of concern, worry or fear relating to the prospect of future floods.	Fear	Indication of fear or worry relating to: • Past experience; • The prospect of future experiences.
	Perceived need to prepare	Informant's indication of views regarding the need to prepare for future floods.	Perceived need to prepare	Informant's indication of views regarding the need to prepare for future floods.
	Perception of safety (sense of safety	Indications from informants regarding their sense of safety on the island.	Threat probability	Informants' views on there being another flood.
	Perception of risk	Informants' views on flood risk.	Threat severity	Informants' views on the severity of future floods.
	Sources of stress	Aspects in informants' lives and environments that create discomfort in regards to flood risk.	Sources of stress	Aspects in informants' lives and environments that create discomfort in regards to flood risk.
	Sources of safety	Aspects in informants' lives and environments that create comfort in regards to flood risk.	Sources of safety	Aspects in informants' lives and environments that create comfort in regards to flood risk.
	Understanding of dangers	Captures informants' understanding, knowledge, & awareness of the dangers they might face if it floods.	Understanding of dangers	Captures informants' understanding, knowledge, and awareness of the dangers they might face if it floods.
			Type of person a flood would be	Informants' descriptions of the type of person a flood would be, if it were a person.

Identifying themes and categories

Themes were identified and assessed based on interpreted (by the author) relevance and relationships to the key concepts. This meant that themes were

identified both inductively and through an a priori approach (Ryan & Bernard, 2003). A priori themes were developed from the author's theoretical understandings of the phenomenon gained through literature and experience. Inductive themes were developed from the data itself.

Segments (excerpts) of transcripts based on thematic codes, were later re-coded to identify core categories identified within these themes. These categories could be descriptive, exploratory, or explanatory, and worked at deepening the interpretation of the themes based on identified properties, aspects, relational implications etc. This re-coding was similar to selective coding as described by Strauss & Corbin (1990) for the final round of Grounded Theory analysis. It involved selecting the categories, systematically relating categories to other categories, validating those relationships, and filling in categories that needed further refinement and development.

Refining themes

Refinement of themes carried two goals (Braun & Clarke, 2006):

1 Check whether themes form a coherent pattern (is it a theme or not?);
2 Check the themes in relation to the entire data set and research questions:
    i Consider the validity of individual themes (internal validity);
    ii Go back and re-code for refined themes.

To refine the themes, tables (in Microsoft Excel for Mac 2011) based on the thematic codes and informants were established; categories identified relative to themes were used to populate these tables. Once complete the tables were printed out and re-examined to pull latent aspects of the categories across all informants' responses. By doing this, themes were made:

- Specific and discrete (non-repetitive);
- Broad and inclusive (encapsulates idea sets from the different coded excerpts).

This refining of themes also allowed for the themes to be evaluated relative to their links to the key concepts. This meant that the key concepts themselves

could begin to be extrapolated to in interpretations of the data. In the end of this step, refined themes for each key concepts had been identified.

Describing and exploring themes

After refinement, written (in Scrivener 2 for Mac OS X) descriptions and interpretation of themes was carried out for each case site. This allowed for the ideas relating to each theme to be assessed from different perspectives and potential interpretations. In addition to written descriptions, graphic interpretations of the themes, their relationships and implications were developed (in OmniGraffle Professional for Max OS X).

Final interpretation of concepts as they relate to the context

The final analysis step involved the writing up of theme description and exploration. This step explicitly focused on linking thematic interpretations to the key concepts.

3.4.2 Secondary analysis

3.4.2.1 Secondary Method - Domain analysis

In Wilhelmsburg most informants had not experienced a flood personally, and it became evident while undertaking the thematic analysis that there was a lack of depth regarding their flood history awareness[11]. Because of this, it was considered necessary to apply an alternative approach to the exploration of informant's flood history awareness in Wilhelmsburg. Domain analysis is an ethnographical interview analysis method (Spradley, 1979) utilized by ethnographers to identify and develop 'domains' that encompass the meaning, organisation and uses people have around specific symbols, terms, words and actions (Spradley, 1979, 1980). To the extent that domains represent groupings of meaning associations around a specific item, event, action etc., they can also be seen as themes. Using the perspective of domains, as opposed to themes, enabled the Author to achieve a deeper exploration of the

[11] In Badda, this was not the case and thematic analysis identified awareness of not only the past floods, but specific events within them, as well as what awareness of what made up a bad flood.

ways in which informant's think and have awareness around the flood history of the island, that was difficult to obtain through thematic analysis alone.

Domain analysis makes use of semantic relationships to identify domains (Spradley, 1979). When people express themselves they will utilize semantic relationships to indicate the relationship between the terms, words, actions, symbols etc. they are using (Spradley, 1979). Because research is showing that the number of semantic relationships people use is actually quite small (less then two dozen), and that many of these are universal across cultures, semantic relationships are considered by Spradley (1979 & 1980) to be extremely useful tools in ethnographic analysis. Although this research is not explicitly structured around an ethnographic approach, the interviews were structured around Spradley's (1979) approach to ethnographic interviewing. As such the data is open to this analysis method.

Of course several semantic relationships could exist and would require a long intensive analysis to fully explore. Given the limitation to time and resources, this study used Table 3.10, Spradley's (1979) list of universal semantic relationships to identify the most prominent semanitic relationships. The themes identified in the thematic analysis enabled the identification of the over arching domain of 'kinds of associations with historical floods in Wilhelmsburg'. Which broke down into 'kinds of outcomes from the 62 flood', 'kinds of causes from the 62 flood', and 'types of people involved in the 62 flood'. It should be pointed out, that thematic analysis alone, may have arrived at similar findings, however, it was the experience of the Author that using domain analysis enabled her to more extensively explore informants' flood history awareness.

Table 3.10 Semantic relationships

Relationship	Description
1. Strict inclusion	1. X is a kind of Y
2. Spatial	2. X is a place in Y, X is a part of Y
3. Cause-effect	3. X is a result of Y, X is a cause of Y
4. Rationale	4. X is a reason for doing Y
5. Location for action	5. X is a place for doing Y
6. Function	6. X is used for Y
7. Means-end	7. X is a way to do Y
8. Sequence	8. X is a step (stage) in Y
9. Attribution	9. X is an attribute (characteristic) of Y

3.4.2.2 Secondary Data: Literature & Observation

Documentary and observational data acted as secondary sources to the primary data collected through interviews with informants. They were not as extensive as the interview data, and therefore, limited in their ability to contribute to the development of themes identified from the interview data. By and large analysis of these sources was linked to the thematic process described previously (Braun & Clarke, 2006).

Documentary evidence was limited due to language issues (i.e. in German or Bengali). One of the most significant limitations due to language was that coding of documents was difficult and accuracy of codes could not be adequately established. Most documentary data obtained in this study was public evidence[12], no real personal evidence[13] was obtained, informants preferred instead to provide their information verbally. One Old Wilhelmsburger (P5) did bring out a number of newspaper clippings she had kept from the 1962 flood and allowed the Author to photocopy these. In addition Food for the Hungry in Dhaka, made available their photographs of the 2004 and 2007 flood events in Badda. Very little physical evidence[14] relating to flooding or flood preparedness was found within the case sites. Because of the absence of private evidence documentary data that could provide contributing or supporting information for informants' perspectives was minimal for both case sites. Due to these limitaitons and difficulties associated with the analysis of the documentary evidence, analysis had to be adapted. The adaptation to the thematic process of analysis involved:

- The review of the documents for contextual aspects and themes. Vaismoradi et al. (2013) highlight the importance of context to qualtitative research in their review of the differences between content and thematic

[12] Public evidence includes documents obtained external to the case site that presents information open to the public (e.g. From the internet, research journals, newspapers, magazines, film, documentaries, government plans, NGO plans etc.).
[13] Private evidence includes documents that are personal to case sites informants (e.g. diaries, photographs, videos, calendars etc.).
[14] Physical evidence included documents obtained from within the case sites (e.g. posters, flyers, local magazines & newspapers).

analysis. To the extent that a researcher can develop an understanding of the context influencing their informants, they can present a "wider understanding of what is going on" (Vaismoradi et al., 2013, pp. 401).

- The expanision of themes regarding: sources of information for informants, general sources of information on flooding, future flooding or historical flooding in case sites, information on protective responses or response options.

Illustration of documentary analysis has been presented through the extended description of the different case sites presents in Appendix B (B1) and C (C1). Where possible throughout the findings chapters (4 & 5), links have been given or reference made to specific documents.

Observation data recorded through the use of a research journal was analysed in the same way as the documentary data and provided information on physical evidence in the case sites, identified to the Author or identified by the Author as having a flood meaning (Table 3.8).

Photographic data obtained as observation or private evidence (i.e. Food for the Hungry's photographs of floods in Badda) was used in three ways:

1. As a means to document physical evidence in the case site like flood marks, memorials, and flood defence materials.
2. As a means to access activities, impacts, & events during past floods (predominately in Dhaka, but also during the 1962 flood in Hamburg).
3. As a means to identify cultural meaning systems that are present in the physical environment of the case sites.

Analysis of visual data like photographs has received increasing attention among qualitative researchers (Knoblauch et al., 2008), however, still remains in its infancy. As put forward by Ball & Smith (1992) an adapted version of content analysis was utilised for the analysis of the photographs.

3.5 Research Quality: validity and ethics

The issue of validity in qualitative research is an area of wide debate (Maxwell, 1992; Johnson, 1997; Cho & Trent, 2006; Guest et al., 2012). This debate

appears to be made up of proponents with multiple opinions. At one extreme quantitative researchers criticise the lack of 'standard' approaches to ensuring validity in qualitative research, and at the other extreme qualitative researchers can go as far as arguing that the concept of validity has no application within constructivist paradigms (Maxwell, 1992). However, for the results of qualitative research to be reliable enough to effectively inform policies, programs and scenarios (have practical and applied value), then some degree of validity must be demonstrable. As such between these two extremes exists a continuum of potential ways qualitative research can demonstrate validity.

This research places itself within this continuum and has identified and applied strategies throughout the research process to protect and promote validity of its findings. Table 3.11 presents a summary of these strategies relative to the type of validity they worked at developing. In addition, the limitations of the study based on validity strategies that were not or could not be utilized, for whatever reasons, are also highlighted in Table 3.11. There are numerous books and articles available on either the debate around the issue of validity in qualitative research, or on the strategies and types of validity out there. This study has based its choices on three main texts: Johnson (1997), Yin (2009) and Guest et al. (2012).

3.5.1 Validity checks utilized in Study (Table 3.11)

Descriptive Validity

'Investigator triangulation' – the use of multiple observers to record and describe the research informants', specifically their behaviour, contexts and reactions during interviews. This is undertaken to obtain *descriptive validity*.

- Field assistants in both Wilhelmsburg and Dhaka were hired and trained to take additional observations as well as act as interpreter and translator. Post each interview the author spent some time with her assistants to capture their thoughts and observations.
    - In Wilhelmsburg: Only one field assistant was available, she had an undergraduate degree, although no interview training, and a high fluency in both German (her mother tongue) and English.

- In Dhaka: Three assistants were available; all either had a university degree or were currently studying to achieve one. Gender wise, two women and one man were hired because:
  - The women would make the informants who were women feel more comfortable, and the man provided an escort as well as assistance during interviews. All three had some interview training or experience, unfortunately the gentleman's experience was through journalism and this prompted him at times to coach the informants on what they should say.

Interpretative validity

'*Member-checks'* – Involved sharing findings with members of the CORFU research group. It was done to create *interpretative validity*.

- Case site findings were shared with partners involved in the CORFU project and reviewed during project meetings and through reports.
- CORFU case site partners were sent results and asked to provide their thoughts on the validity of the findings relative to their contextual knowledge of their homes, as well as their academic knowledge of the flood perceptions and behaviours in the case sites.

'*Verbatim'* – involves using the exact words of informants to help obtain interpretative validity. In this way the reader can experience the informant's actual language and assess *interpretative validity* himself or herself.

- Throughout the analysis and write-up phases of this study, supporting excerpts are provided verbatim to enable readers to judge interpretations & findings.

Theoretical validity

'*Peer-review*' – Involves dissemination and discussion of findings with colleagues to get alternative viewpoints and input.

The findings for the Wilhelmsburg case site were presented at ICFR (International Conference on Flood Resilience) in 2013. In addition to the presentation a paper for the conference proceedings was submitted and

accepted. This provided interesting feedback from the attending scientists. Unfortunately as of yet the findings for the Dhaka case site have not been published.

'*Extended fieldwork*' – A sufficient amount of time is spent studying research informants and the phenomenon of interest. This builds confidence that the relationships and patterns being identified by the researcher are *theoretically valid*.

- Fieldwork extended between 2 (in Wilhelmsburg) and 3 (in Dhaka) months this better enabled the author to gain a deeper understanding of the context and the phenomenon.
- However, more time in both case sites would have been beneficial for the study, but could not be achieved given time available.

'*Pattern matching*' – this involves predicting a series of findings that form a pattern (theme, concept) and determining to what degree the findings fit these prediction.

- Identified themes, were tested against individual cases' responses, as well as community or groups (e.g. Old Wilhelmsburgers) to check their applicability.
- In Dhaka this was limited to tests against individual cases (informants) as only one urban community was involved (i.e. urban-poor women).

'*Negative case strategy*' – This is similar to pattern matching, however, it involves locating and examining cases that disconfirm the researchers tentative interpretations and explanations.

- Each case (urban communities) was examined for irregularities, differences, comparisons and contrasts with the themes identified.

Construct validity

[semi][15] '*Methods triangulation*' is employed to provide construct validity. Method triangulation utilises different methods to obtain different types of data to build valid findings. Although, this study utilised three data collection methods, it is the consideration of the Author that true triangulation of the data was restricted. This is due to the fact that the language limitations around the documentary evidence, meant that a more in depth use of many of the documents collected could not be achieved to verify the identied themes and points of interpretation. However, research journals, reports, local disaster information (pamphlets etc.), online articles, online films & documentaries, and photographs received from case site stakeholders, were all utilised to build as detailed an understanding of the context as possible. This understanding in turn provided reference points for the development of the thematic & theorectical interpretations. Given the emphasis placed on context in both Pragmatic and Case study approaches, having these documents to build up a contextual understanding (in depth detail of these is presented in Appendix B & C in Sections B1 & C1) provided a point from which more contextually orientated interpretations could be achieved. From the perspecptive of these [philosophical] methodological approaches, the intimate link between context and findings, increases the accuracy of the findings (Giacobbi et al., 2005; Biglan & Hayes, 1996; Yin, 2009). In additional, documents provided more extensive awareness of the sources of information available. This enabled the Author to better assess informants' responses in regards to sources of information.

Observations were utilised to help substantiate and validate informants' responses, as well as enable a broadening of local cultural and social issues, topics, and behaviours. In this way this data was considered to not only provide points of contextual development, but also theorectical.

[15] 'semi' is utilised here to highlight the potential shortcomings of this process due to limitaitons to do with the documents.

As mentioned in previous sections, this is a qualitative study. As such it is interpretative and explorative, and research bias and subjectivity is an on-going issue to monitor through out. Limitations in the time and resources available to this research limit the extent to which validity strategies could be better employed. In addition, personal and reflective lessons learnt (by the author) regarding the heavy requirements in time and manpower associated with case study and qualitative research are both a limitation and achievement in this study. A limitation in regards to the findings, but an achievement in regards to the personal development of the author herself. She once again openly acknowledges subjective limitations to this work and values the continued refinement of it through others interpretation and knowledge.

3.5.2 Ethical considerations

As a study that involves the participation of people, it is important that ethical issues be planned for and managed through out a research endeavour (Robson, 2002; Yin, 2009). Appendix A (Section A.2.4) lists and describes the ethical considerations taken in this study.

Table 3.11 Validity checks and limitations to the current study.

Validity type	Definition	Specific case study tactic	Phase of research in which tactic occurred	Limitations
Descriptive validity	The factual accuracy of the account as reported by the researchers - i.e. accuracy in reporting descriptive information (e.g. description of events, objects, behaviours, people, settings, times and places).	• *'Investigator triangulation'* – got field assistants & interpreters to provide descriptions on what they observed, & compare observations.	• Data collection.	• Although trained, assistants found it hard to formulate their observations & constructively discuss them.
Interpretative validity	Accurately portraying the meaning attached by participants to what is being studied by the researcher.	• '*Member-checks'*: ○ Case partners reviewed findings during project meetings & through reports. • *'Verbatim'* – supporting excerpts are provided verbatim to enable readers to judge interpretations & findings.	• Data analysis; • Write up/composition.	• '*Participant feedback*' could not be carried out in either case study due to time constraints.
Theoretical validity	The degree to which a theoretical explanation developed from the research fits the data and, therefore, is credible and defensible.	• '*Extended fieldwork*' – fieldwork extended between 2 & 3 months. • '*Pattern matching*' – as theory was developed it was continuously checked against the data to see if associated predictions held. • '*Negative case strategy*' – theory was compared across all cases (urban communities) to check for cases that did not match the theory. • '*Peer-review*' -Presented results at conference, & wrote a paper for the conference proceedings.	• Data collection; • Data analysis; • Write up/composition.	• Although, the fieldwork extended over several months, the need to do two limited this time being longer. • Only Wilhelmsburg's findings have been presented at a conference for peer review.

Validity type	Definition	Specific case study tactic	Phase of research in which tactic occurred	Limitations
Construct validity	Establishing correct operational measures for the concepts being studied.	• [Semi]'*Methods triangulation*' – used three data collection methods. • 'Pilots' – tested the reliability of the interview schedules.	• Data collection; • Data collection & analysis; • Composition.	• The informant pool in Dhaka could only extend to 10, this limited the gathering of different perceptions within the urban-poor community. • Pilot interviews could not be carried out in Dhaka.
External validity	Establishing the domain to which a study's findings can be generalised.	• '*Contrasting cases'* - used a case context similar to previous work (i.e. Hamburg) & a contrast case context to examine potential limits to generalisability.	• Research design.	• Limited number of urban communities included in the study, therefore, generalizing to those not included in not possible.
Reliability	Demonstrating that a study can be repeated with the same results.	• Used case study protocol; • Developed data & analysis protocols.	• Data collection; • Composition.	• Is an interpretative study, others may interpret the findings differently to the author.

(Source: adapted from Johnson, 1997 & Yin, 2009)

Chapter 4 Wilhelmsburg, Hamburg - Living with the threat of future flooding

This chapter presents the exploration of contextual, informational and cognitive concepts believed to be influencing the Flood Protection Motivation in Wilhelmsburg. The following sections present the findings from the exploration of these concepts. All Sections except for Section 4.1 (context) are based on analysis of interviews and observations; Section 4.1 provides an overview of the context within the case sites, more in depth description of the context is provided in Section B.1 in Appendix B – contextual analysis was based on analysis of documents, observations, and in part interviews.

Two important notes to make before starting are:

- The interpretation of concepts (Figure 3.7) explored here are based on informants' perceptions[16], and are interpreted (by the author) as the experience and perceptions of the informants of this study. In truth their perceptions may or may not accurately reflect the actual situation in Wilhelmsburg, or even what other residents in Wilhelmsburg experience and perceive as being the situation. However, the informants are residents of Wilhelmsburg and what they perceive will be interpreted by them as the 'truth' and under pragmatic thinking this truth can be considered what they know (Giacobbi et al., 2005; Friedrichs & Kratochwil, 2009). What they know is considered by Figure 3.7 to be influencing how informants are thinking of flood risk, or even if they are thinking of flood risk, and the consequences of this for their motivation to prepare.
- This is a cross-sectional study so the findings presented here are based on the informants' perceptions late 2011. It should be noted that by completion of this thesis in 2014, events such as the 50th Anniversary of the 1962 flood will have taken place (2012) and the International Building Exhibition (IBA) and Garden Show (IGS) will have been completed (2013). There could also

[16] Where possible, the author has provided alternative viewpoints & evidence either supporting or challenging what informants have suggested, but for the most part this exploration looks at the informants' perceptions of their site (as interpreted by the author).

have been one or several large storm surge or flood events in Hamburg or Germany or even elsewhere in the World. All of these events, plus any number of changes in the social dynamics (identified to be taking place in 2011), will have had an impact on the community composition and perceptions in Wilhelmsburg. If considered of interest or import, the author has provided indication of changes she observed when visiting Wilhelmsburg briefly in mid 2013. Figure 4.1 presents the layout of this chapter.

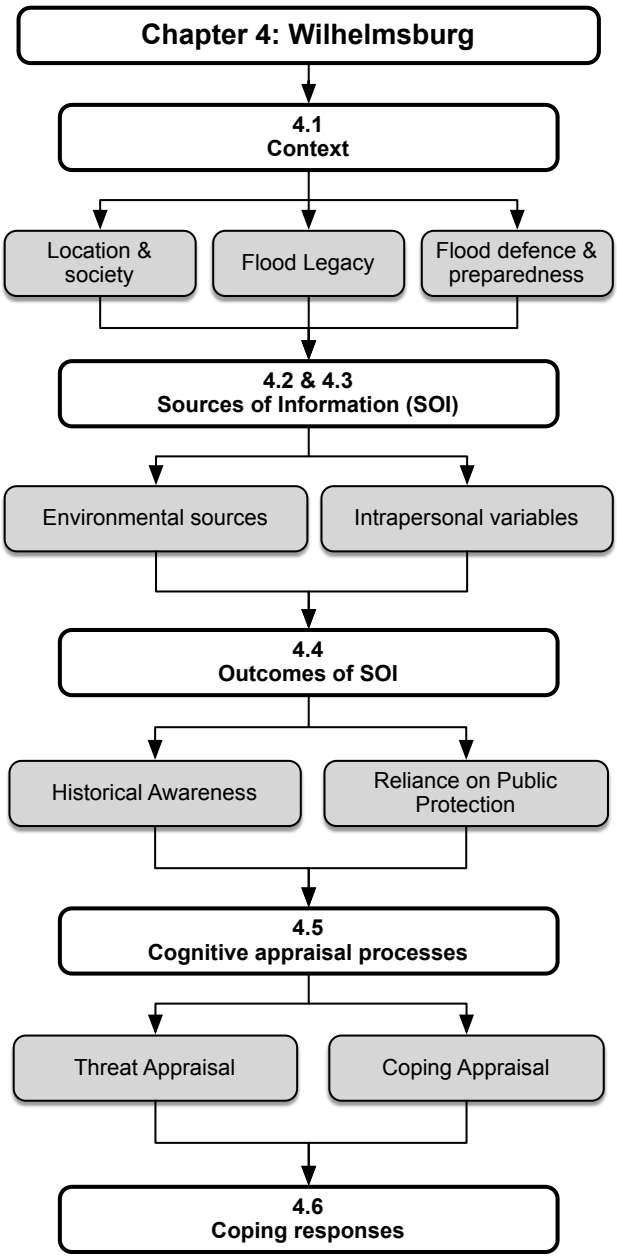


Figure 4.1 Chapter layout and breakdown.

4.1 Context – Wilhelmsburg an island with a future flood risk

4.1.1 Location & society

Located in the north of Germany (Figure 4.2) on the banks of the River Elbe, the Free and Hanseatic City of Hamburg is the second-largest city in Germany, and sixth-largest city in the European Union (relative to population size which as of March 2012 was reported as being 1 802 041 people) (CityMayor Statistics, 2012). Hamburg's location near the mouth of the River Elbe (estuary) has enabled it to become the third largest port in Europe and the tenth largest worldwide. With a GDP earnings of between 84 (2009) and 94 (2012) billion Euros, Hamburg has the largest GDP of all the German Federal States and is considered to be one of the most affluent cities in Europe (HWF, 2012).

(Source: Google Earth)

Figure 4.2 Location of Wilhelmsburg and its suburbs.

The Elbe River, which could be considered largely responsible for enabling the City of Hamburg to become the vibrant economic and cultural hub it is today, has a total length of 1165km (Port of Hamburg, n.d.) and transverses two countries the Czech Republic and Germany. The Elbe estuary is historically the site of 'naturally' occurring marshlands that were inundated relative to daily tidal events (Figure B.2, image A). Through the use of dikes, this marshland has

slowly been separated from the tidal properties of the river (Loeper, 2009), and resulted in the development of the island of Wilhelmsburg. Wilhelmsburg is the largest (52km^2) Elbe-estuary island, and is considered to be the largest river island in Europe (BSU, 2007b; Gourbesville & Batica, 2011). It is situated south of the main city centre of Hamburg, and is surrounded by the north and south branches of the River Elbe (Figure 4.2).

The island has staged many social transitions and historically important events. As a space it has moved from agricultural borderland, just outside the main map of Hamburg to modern exciting 'laboratory' for architectural and sustainability experiments and ideas (Chamberlain, 2012). The south of the island was historically agricultural, populated with a few small villages (Kirchdorf, Figure 4.2) (Loeper, 2009). The residents in these areas most often had ancestral roots to the island, and came from families who had been working and farming on the island for several generations. The north of the island (Reiherstiegviertel, Figure 4.2) was home to harbour workers in the nineteen hundreds and early twentieth century, men that most often came from migrant backgrounds (*Gastarbeiter*) (predominantly Turkish and Eastern European) to work in the ship yards and in the port. With the end of the Second World War in 1945, numerous homeless residents and refugees sort refuge in Wilhelmsburg, many of them ended up living in small 'garden houses' situated in the lower-lying areas of the island. In 2011 just over 50 000 people (Statistisches Amt für Hamburg und Schleswig-Holstein, 2011) were determined to be living on the island.

The working class [labourers] and mixed-race social climate on Wilhelmsburg over time built a reputation of it being a socially deprived area, with high rates of unemployment (10,7%), welfare recipients (4,5% of overall welfare recipients in Hamburg) and foreign residents (34% of Wilhelmburg's residents) (Gourbesville & Batica, 2011). The city's use of [Nieder] Georgswerder a suburb on the north east of the island (Figure 4.2) as a dumping site for Hamburg's waste and rubbish created ecological issues and the view that the island is environmentally toxic (Figure B.6) (Schmidt, 2012). In addition, the island is

crossed by a main highway and railway network, and surrounded in the north and south west by port and harbour activities. All in all affecting the island through noise and odour pollution (Schmidt, 2012). However, with the increasing numbers of people being attracted to Hamburg, residential space has become scarce, and Wilhelmsburg's prime position near the centre of the city makes it prime real estate. As such the island has become a core component of the city's 'growing city' vision (Figure B.1 & Box B.1), and 'Leap over the Elbe' scheme. These ultimately aim at changing Wilhelmsburg's reputation and making it an attractive district with a distinctive identity (Schmidt, 2012). This endeavor is being facilitated through the International Building Exhibition (IBA) and the International Garden Exhibition (IGS) (2006-2013) (BSU, 2007b) (Section B.1.4), which showcased the strategies for dealing with the multifarious social and hazardous situations in Wilhelmsburg (Schmidt, 2012).

An unfortunate trend has been the loss of the island's historical disaster culture and 'amphibian society' (Kempe, 2007). As the dikes have heightened, people's view of the tidal nature of river has been increasingly blocked out, and with it their awareness of the potential flood risks, risks that are projected to increase in the near future (von Storch et al., 2008; Knieling & Fellmer, 2013).

4.1.2 Flood Legacy

Wilhelmsburg's location on the marshland of the Elbe Estuary means that historically floods frequently inundated this area of land. However, as mentioned above 'amphibious societies' adapted to life in a disaster prone area lived on the island. In the last century only one significant flood event has occurred. On the 16th February 1962 the river breeched the dikes and inundated the island (and many other areas of Hamburg). This flood hit the island hard leaving its infrastructure in disrepair and its residents in shock (>300 dead and over 20 000 homeless). Since this event two larger storm surge events (from the North Sea) in 1976 and 1978 have occurred, however, these did not breech the island's structural flood defences (von Storch et al., 2008) (Figure B.4).

4.1.3 Flood management & defence

The 1962 flood had the effect of renewing the city's awareness of the need to more actively maintain its flood defences, and it took extensive steps to ensure that a catastrophe of that degree did not occur again. Massive investments were put into restructuring coastal defence in the area (von Storch et al., 2008). The dikes were restored, heightened and strengthened, and legislation regarding what could be done on them tightened to ensure that no activities (e.g. building on them, using them to grow vegetables etc.) that could cause them to weaken be carried out on them (Figure B.3).

Flood management is Hamburg is overseen by two main ministries, the Behörde für Inneres und Sport (BIS) (Ministry of Internal Affairs and Sport), who are responsible for emergency response and planning in the city, and the Behörde für Stadtentwicklung und Umwelt (BSU) (Ministry Urban Development and Environment), who are responsible for the long-term development and management of flood defence in the city (Figure B.8). In Wilhelmsburg programs and policies are implemented by three main agencies:

- Bezirkamt Hamburg-Mitte [*Borough of middle Hamburg*] - responsible for monitoring weather conditions and storm surge predictions, developing and implementing emergency plans (e.g. evacuation) and flood preparedness initiatives (e.g. evacuation-collection points, signage, emergency pamphlets and information).
- The Hamburg Port Authority (HPA) - monitors and prepares the harbour areas; and
- The Landesbetrieb Straßen, Brücken und Gewasser (LSBG) [*Agency of Roads, Bridges and Waters*] - mandated to undertake development, design, construction, maintenance and management of the structural defences (i.e. dikes).

At a local-level emergency services (Box B.2) are employed to help facilitate evacuations and help the people during an emergency. In addition, dike defence and maintenance, during an emergency, is overseen by two local associations in Wilhelmsburg: the Deichwacht (Figure B.14) and the

Deichverband (Table B.2), which are made up of local volunteers. The Deichverband is also involved in improving awareness of residents, and in generating personal interest in the topic of flood risk and protection on the island (Wasserland, 2007?).

Flood management in Hamburg makes use of both structural and non-structural flood defence and preparedness strategies. Wilhelmsburg's structural defence is solely reliant on its large ring dike that encircles the island (23.8km long) (Figure B.10). In terms of non-structural strategies, two main groups can be identified: preparedness initiatives and evacuation (during event) plans. Evacuation plans, involve the logistical preparations required to warn (via radio, hot lines, teletext, television, and telephones) residents and organise and manage their evacuation from the island (Figure B.11), made especially complicated by having only four main roads off (Gourbesville & Batica, 2011). Preparedness initiatives involve activities and attempts to inform and build awareness amongst vulnerable communities of their risk and the need to be prepared, these include:

- The BIS's emergency pamphlet to all residents of the island in German (Figures B.15 a & b German version, B.15c English version).
- BIS has:
  - Published several brochures on storm surge protection,
  - Offers advice through its website[17];
  - Organizes awareness events (e.g. Disaster Protection Day - inclusive of talks, simulations, and exercises), flood defence exercises and emergency training, and children's awareness events (e.g. Elvis und Bär unterwegs, Hochwasserschutz in Hamburg - Evis and Bear on the way: Flood protection in Hamburg) (Weichselgartner, 2008).

In addition, the city has developed and sponsored numerous research projects (Table B.1) concerned with investigating the impacts of climate change and future shifts in sea levels. As there are limitations to how high the dikes can be

[17] (http://www.hamburg.de/katastrophenschutz/)

made means that there is an increased need for the residents to be aware of the risks. Therefore, ensuring that people are aware of the river, its dynamics, and the importance of the dikes is important. Several initiatives have been conceptualised to help achieve this:

- The Deichpark (Dike park) is IBA's approach to reconnecting the residents of the island with the river around it. It promotes the dikes and the space occupied by them as zones in which residents and visitors of the island can enjoy while learning about what the dikes are, what they do, and why they are necessary (IBA-Hamburg, 2011) (Figure B.12).
- Recreating an amphibious or water culture through promoting a society that has a emotional bond with the water surrounding them (i.e. 'my waters/our waters'), and in so doing the river becomes part of the tangible and lived reality of the local population (Wasserland, 2007?). To facilitate this in Wilhelmsburg, three projects have been envisioned: the flood pillars (Figure B.13), hydraulic playground (Wasserland, 2007?) and dike protection school (SAWA, 2007?).

The city of Hamburg is doing much to work at making its waterscapes safe places to live and work, and on Wilhelmsburg there is evidence that there are people and organisations actively trying to bring home the message that a future flood may happen. However, while in Wilhelmsburg, in 2011 & 2013, the author did not observe much evidence of all these initiatives on the island, and identifying them required extensive literature and Internet searches, as well as conversations with people involved in flood risk awareness programs.

4.2 Intrapersonal variables of cases

This section explores the intrapersonal sources, which include personality variables and prior (direct) experience/s.

4.2.1 Interested Germans - Informants' characteristics

The informants in this study were largely made up of what the author has termed 'interested Germans', those people living in Wilhelmsburg who have got some interest in the flood situation of the island. They are predominately

German or have immigrant ancestry but have lived on the island for over ten years or more. Although demonstrating interest (or at least willingness in participating), these informants are also more likely to carry a higher awareness of the situation as their interest may have guided them to do some personal investigation.

In terms of the characteristics of informants, there are an equal number of male and female informants, ranging from early twenties (23 years) to seventy. Most informants are German, however, three informants come from immigrant backgrounds (Turkish, Iranian and mixed). Informants have lived in Wilhelmsburg between less than one and seventy years. Table B.3 (Appendix B) presents the attribute information for the different informants.

4.2.2 Informant, community groups identified in this study

Among informants, five community groups were identified. It should be pointed out that community structure of the island is not confined to these groups and the groups described here are those that emerged from interviews and personal experience on the island, for the most part how informants talked about each other laid the foundation for the identification of these groups. Interestingly, informants appeared to describe community differences based more on time lived in Wilhelmsburg than ethnic differences. This meant that two main groups could be identified: ‘Old Wilhelmsburgers’ and ‘New Wilhelmsburgers’. Old Wilhelmsburgers are those who have lived there most of the their lives and have generational ties to the island, where as New Wilhelmsburgers are those people who do not have generational and familial ties to the island and have lived on the island under 40 years.

Within the New Wilhelmsburgers group four other groups were differentiated by informants, these include: ’New Wilhelmsburgers’; ‘Students’; ‘Immigrants’; and lastly those who ‘work’ in Wilhelmsburg, but do not live on the island. As only one informant made up the ‘works in’ Wilhelmsburg group, it was decided not use this as an analysis group. Responses from this informant were similar to those of New Wilhelmsburgers and as such were incorporated into this group.

Figure 4.3 shows the different groups, as well as the number of informants representing each group in this study.

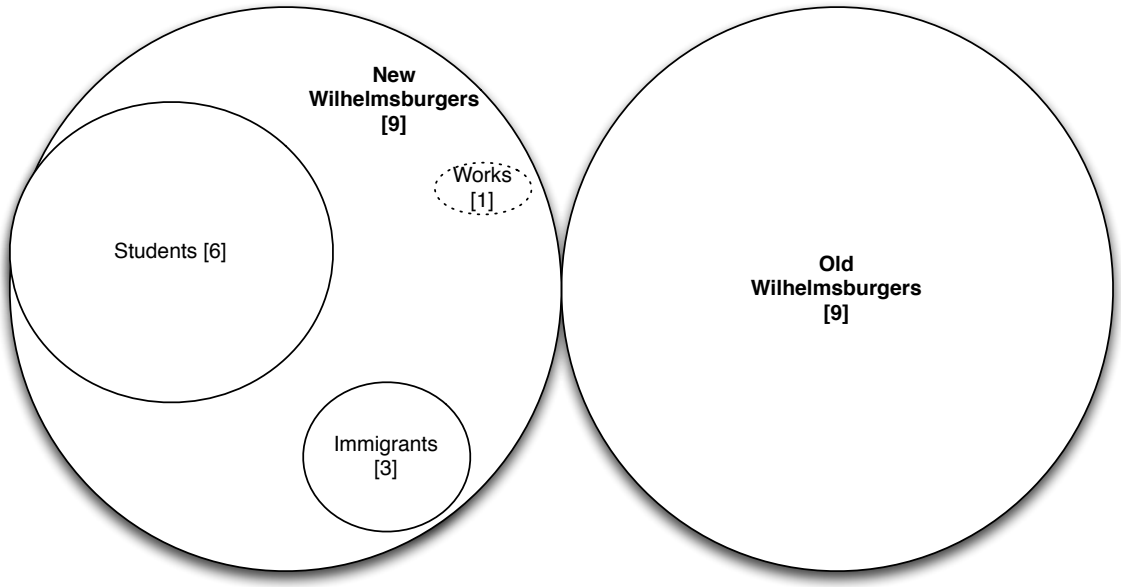


Figure 4.3 Different informant groups. Circle size indicates the no. informants in each community group, bracketed number indicates actual no.

New Wilhelmsburgers

New Wilhelmsburgers can be defined as an informant who has lived in Wilhelmsburg under 40 years and has no familial or generational ties to the island, and is not currently studying, and did not have clear immigrant/ethnic backgrounds (i.e. German). Nine informants (6 female: 4 male) where classified in this group (Figure 4.3). These informants ranged in age from 37 to 66 years and the majority (67%) indicated intent to carry on living in Wilhelmsburg at least for a couple of years.

Informants in this group indicated concern for the social character or the poor quality of Wilhelmsburg (i.e. its a "*socially deprived district"* P11*, "socially-troubled district*" P2), along with the openness and friendliness of the people and the physical elements (i.e. Green/ rural/ close to nature; close to the city). The responses of this group often included a detail breakdown and education on the different parts of the island, often coupled with some historical aspects believed to be of interest to the study by informants. The information given and the manner in which it was provided gave the author the impression that many

of these informants had come to live in Wilhelmsburg out of 'interest'. Whether it is interest in the people and their circumstances (i.e. Christian missionaries) or interest in the 'lifestyle' and history (i.e. university professor).

Immigrants

These are informants with immigrant backgrounds, and includes those who have members who have lived up to one generation in Germany, or are themselves first generation German. It proved difficult to get members of this group to interview, as many were not interested in the topic or could not spare or find the time to participate. In the group of informants interviewed for this study three informants fell into this community (Figure 4.3), all of them where born in their countries of origin (Turkey & Iran). Two where aged between 26-29 years and pursuing studies in Hamburg, although they were both born in other countries, they had grown up in Hamburg and had lived there over 18 years. The third informant was 55 years old, and had grown up in his country of origin (Turkey), but had lived in Wilhelmsburg over 10 years and was well integrated into the local environment. All three informants are male.

In describing their environment, those informants with immigrant backgrounds presented no evidence of an association with home in considering Wilhelmsburg. There was a sense of highlighting the poor social conditions, and 'neglect' (by the city) perceived to be behind these conditions (e.g. the lack of consideration as to where to put the incoming population to Wilhelmsburg after the flood; and the creation of the blocks of flats in Kirchdorf Süd to house the unemployed and disadvantaged people P17). Interestingly informants of this group did not highlight recognition for the multi-cultural character of the district. Aspects that overlapped with other groups included the recognition of the 'green' areas of the island and the openness of the people. The younger members of the group held views close to those that might be seen in the Students and the New Wilhelmsburger groups, although did not highlight points of 'lifestyle' as the majority of students did. These informants presented a 'mixed' association with Wilhelmsburg.

Students

This group is made up of six informants who at the time of interview where full-time students (Figure 4.3). Informants in this group ranged in age from 23 years to 43 years and some division between informants aged below 30 (3 informants) and those aged above 30 (mature students; 3 informants) was observed (3 female: 3 males). Mature students tended to hold views similar to New Wilhelmsburgers, while those aged below 30 had far more carefree views.

Students are in Wilhelmsburg for the 'lifestyle' (e.g. 'pubs', 'parties', 'lively environment'), they enjoy the social-scene that exists on the island and show a fair degree of separation in terms of sentimentality and historical interest. They are interested in the 'now' and what that is providing for them. Their views on the socially disadvantaged and 'run-down' feeling of the island are in general connected to a sense of personal discomfort with the situations. In general, they have a 'live-and-let-live' perspective on the social dimensions of Wilhelmsburg. They enjoy the diversity of community that is present in Wilhelmsburg, and during their interviews mentioned or referred to all the other community groups.

In talking about Old Wilhelmsburgers, Students showed a lot of respect. They commented on how easy it was to get in touch with Old Wilhelmsburgers and valued their high participation in local issues. Although, informants from the student group did recognise that Old Wilhelmsburgers were battling with all the changes that were taking place on the island, due to IBA and the shifting population structure.

Students are largely seen as an indication of change in Wilhelmsburg. They have been encouraged by the Hamburg Government to come and live in Wilhelmsburg through housing subsidies (reported by other informants but not any students interviewed). In coming they have not only begun to change the population structure, but also encourage growth in local businesses that provide places to socialise, the one most often cited by informants was the increasing number of small coffee shops that have opened up.

Old Wilhelmsburgers

Old Wilhelmsburgers could almost be considered as the 'indigenous' population on the island, and many of these informant's described the presence of an innate local 'island'-culture that exists within this community. Many lived through the 1962 flood, but even amongst those who had not (be it because they were not born yet, or were away during the event) there was deep respect for the flood-dynamics of the island, which they recognise as being the norm. Most of these informants plan to stay on the island long-term. Nine informants were identified as belonging to this group (4 females, 3 males and 2 couples) (Figure 4.3).

The over arching impression received from Old Wilhelmsburgers (by the author) was 'home' or as they themselves said '*Heimet*'. Wilhelmsburg to this group of informants represents a significant part of their personal and familial history, and because of this they have strong ties to the area and deep and sentimental experience of place. These informants indicated pride and contentment in their social connections (e.g. "*Close to family and friends*" P14; "*close community*" P20) and/or physical appeal of the island in terms of diversity of environment. They indicated sadness in terms of elements to do with social decline.

It goes without saying, that Old Wilhelmsburgers are the best source of information on their community and culture; however, the changes that are taking place on the island are increasingly putting pressure on their way of life. Old Wilhelmsburgers, it would appear, are becoming a minority and this is sad as they are a group of people who carry a lot of 'indigenous' knowledge about living on the island; and not only an awareness of the importance of the dikes, but an attitude of responsibility for them and their maintenance.

For Old Wilhelmsburgers lack of integration does not mean just into German culture in general, but into their personal 'island-identity'. They emphasise in their interviews how they are trying to integrate the New Wilhelmsburgers, but that they feel like there is a barrier between them and the new inhabitants of the island. They struggle with the changes taking place, but recognise the need to try to adapt, unfortunately it appears that their adaptation strategies involves

trying to change the other communities to conform with theirs. This in many ways is causing tensions between the different communities and opens the way for many misunderstandings: "*Old Wilhelmsburgers try to hold onto their identity, while new comers do not have it, so although the Old Wilhelmsburgers try to integrate the new comers it doesn't work. This creates tensions between the two groups…*" (P28).

4.2.3 Prior [direct] Experience

As can be seen from Figure 4.4 the majority of informants did not experience the 1962 flood event (20 informants, N=28). Of this selection of 'No' experience informants, four had experienced the 1999 earthquake in Turkey, but did not have experience with flooding. This implies that very little direct-flood experience is left in Wilhelmsburg.

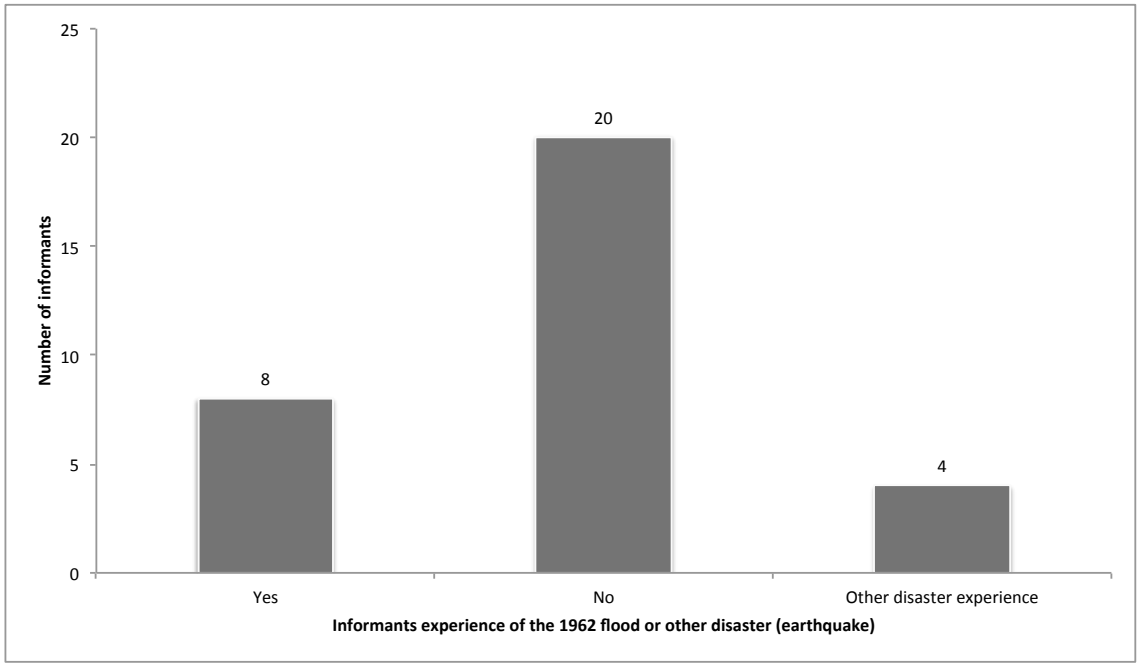


Figure 4.4 Informants who did ('Yes') or didn't ('No) experience the 1962 flood, and those who have experienced major disaster experience elsewhere - in this case all four had experienced the 1999 earthquake in Turkey.

In the case of those that did experience the 1962 flood, there is evidence of comparison between their past experience and what they expect to happen into the future: "*Well, in this case I can say for sure that the Behoerden [authorities]…there's always, instantly they would be alarmed and help would follow and something like 62 that it took so long there, till help arrived. Till a*

helicopter came and…yes, the soldiers helped. The help would be there instantly [now]*. That's also something that calms you down*" (P5). Interestingly in describing their experience these informants did not involve assessment of the potential severity of the next flood, only of their own ability to effectively respond and/or offer help if another flood happens, Box 4.1 lists some of their responses.

Box 4.1 Informants' quotes regarding their response in the event of another flood

- "*Probably would then go here to the police and tell them, 'Well, I'm a, I have some experience in disaster work, what can I do? Is there anything I can offer help?*" (P3);
- "*I would try that I could get over to the old people, I would help. I would try to help*." (P4);
- "*Yes! Yes! Yes! I would stay and help*." (P5);
- "*I'll be here. I'm defending the dikes*." (P8);
- "*I would stay in my floor, I think and look. And will say the other people in the house to come in my floor also*." (P13);
- "*I would carry my, die wertvollen Dinge, die mir wichtig sind,* [valuable things, things that are important to me] *upstairs. I would look for my parents. I would look for brother, if we could help each other. Stay together*." (P14).

Most prior experience described by informants was from Old Wilhelmsburgers who either experienced the flood themselves, or whose family was involved. One New Wilhelmsburger, who was nine years old and had been living in Blankenese (Hamburg) during the flood, recalled going down to the river with her parents to have a look, she could also recall the electricity going out, and that there was no school. Table 4.1 provides informants' personal accounts of their experiences during the 1962 flood. Both 'events' that stood out in their memories, and coping responses employed during the flood to stay safe or help others could be identified from these accounts (Table 4.1).

Table 4.1 Described incidents and coping responses experienced by informants during the 1962 flood in Wilhelmsburg.

Placed experienced 62 flood	Events experienced during 62 flood	Coping responses used during 62 flood
In Wilhelmsburg	• "*I was just sewing a masquerade costumes… then in the night came, around half two, three, they knocked on the window: 'Get up, get up, water's coming.' We said they all must be nuts. Out, getting dressed, put on trousers. The whole sky over Hamburg was red, we don't know why. My husband*	• "*In general it was very nice with the community. Because the **ones who had something shared it with the others**. The ones that didn't have anything or little and couldn't...hmmm they sat there 'Come here, we eat together.' Then we, one cooked*." (P4); • "*They stood, **they sat on their***

Placed experienced 62 flood	Events experienced during 62 flood	Coping responses used during 62 flood
	and I went in again and told my parents; 'Get dressed, we don't know what's coming!' And then around, what was the time? 5, half 5 came people: 'The water's coming. The water's coming.'" (P4); • "*And we had a baker, who had horses and they came as well, running behind, with the people and where it was the highest they stopped. They sort of sat with us on the slope. We were astonished". Yes we had rats, but because of the movement they got sucked away and the rats were everywhere and took out the food… and then came the looters, also with a rowing boat they have, rings, earrings they stole. And then there was the police, and the army and so on and they also shot. And two were shot*." (P4); • "*During the night we were woken up... in the night at 2 o' clock and dressed."* (P5); • "*From the kitchen window, I saw a woman, where* [Mr.] *Kohl was, she was caught from the roof, was caught by the waves and died; and a big life raft got caught in a fence, there was a barbed wired fence, and yes, it was totally gashed and the soldiers* [in the raft] *were not...you couldn't save them*." (P5); • "*I was on the road going dancing, yes. And I came home late, at 10. And then the sirens went off and there were also loudspeaker vans in the area and warned*." (P9); • "*But not just that they've stolen here, that, how do you call it, looted, but some wheeler-dealers came by and one in a boat offered cigarettes and neighbour's father was a strong smoker and he would have liked cigarettes and the dealer said, 'One cigarette, one Mark.' As a response to that the neighbour's father grabbed a toy spear, he once was a seafaring man and brought this for his children, through it in the inflatable boat and then of course it burst*	***roofs, because they went up fast. They all sat upon the roofs****. They couldn't come up fast enough to us, that what was around us. They sat upon the roofs*." (P5); • "*Us soldiers were employed in Wilhelmsburg in the high water. There I came back and helped as a soldier... Our job was to come here to save, to help. We did it. And after 5 days, 6 days we left and the civil help organisations came and put everything back into order. We were just, from this perspective, here first, also because we were so many. The other came from elsewhere, later on. From southern Germany, everywhere. Also the English helped, the Americans helped, the Dutch. Everyone came here, the military*." (P8); • "*We were **gathered upstairs** and the next day **came the army with assault boats** and they let us climb out of the window and drove us to the museum. That is located on a hill*." (P9); • "*I was afraid that something gets stolen here. And I fought my way through to my uncle, who lived in the Schoenfelder Strasse and had a boat. And then **he took me in his boat** till here and **then I got back into the house and spent the time here till the water went back***." (P9); • "*I just experienced it as a small child, I don't have any memories and we also lived in the old Wilhelmsburg that… the house where we lived in, it obviously was under water and my **father brought his car to a safe spot so it wasn't in the water***. " (P14).

Placed experienced 62 flood	Events experienced during 62 flood	Coping responses used during 62 flood
	and then they sat in the water with their cigarettes." (P9).	
Elsewhere in Hamburg	• "*I was 9 years old. And we knew there was a big storm and I was living in Blankenese and it was in the night*" (P7).	• "*And the next morning there was no electricity. And so we knew something has happened and **we heard it on the radio, we had a battery radio***." (P7).

4.3 Environmental Sources of Information (SOI) in Wilhelmsburg

Analysis of environmental SOI looked at two different aspects:

1. What informants described or reported in their interviews concerning SOI; and
2. The outcomes of information sources in terms of informants' historical knowledge of flooding in Wilhelmsburg, and informants' reliance on the city's flood protection.

The findings for the first aspect is presented in this section, the findings for the second in the next section (4.4). Both verbal persuasion and observational learning information sources were identified in the interviews with informants.

4.3.1 Verbal Persuasion sources

Verbal persuasion sources involve the passing of information on from one person to another, the source is external to the receiving person, the information is often second-hand, and involves both written and oral forms of communication.

Community Interactions

Informants reported hearing about or talking about the threat of flooding, or flood history, with a wide array of community members: Old Wilhelmsburgers, family, friends and peers (Table 4.2). In general Old Wilhelmsburgers are reported as being the primary source of information regarding the flood history of the island (Figure 4.5). New Wilhelmsburgers, Immigrants, and Students described Old Wilhelmsburgers as: 'elderly German people', 'contemporary witnesses', and 'survivors of the 62 flood' (among others) (Table 4.2). Where-

as the other groups appear to rely on less personal community sources (e.g. neighbours, friends & peers), Old Wilhelmsburgers have far more personal connections, and reported having received their information primarily from family members (father, mother-in-law, husband, Figure 4.6; Table 4.3).

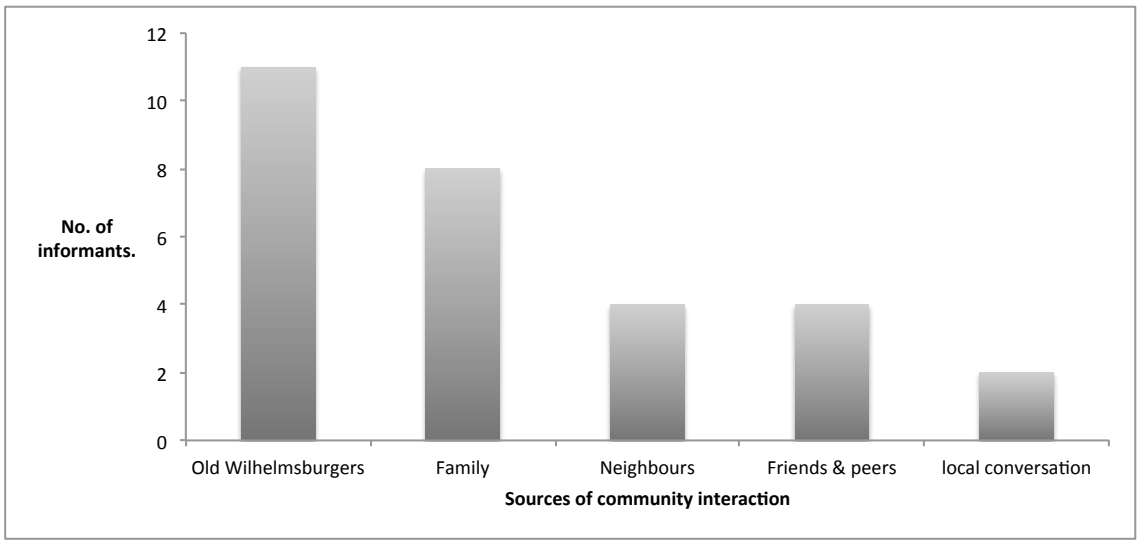


Figure 4.5 Sources of community interactions involving discussions regarding 'Flooding' or 'flood defence' in Wilhelmsburg, reported by informants.

Many informants referred to their 'neighbours' as either SOI or people who they have had to give information to (Table 4.2 & 4.3). Their 'neighbours' credibility is rarely described in detail, so its assumed here that where information is being received most of these 'neighbours' are Old Wilhelmsburgers, alternatively where information is being given out these 'neighbours' fall into one of the other groups. However, the role of the 'neighbour' seems a significant one in terms of verbal persuasion sources in Wilhelmsburg. This seems especially true for New Wilhelmsburgers, whose interviews imply that their neighbours are their second most important source of community interaction in respect to flooding (Figure 4.6). One informant described how she had asked her 'neighbour' on what she would do if it flooded - "*I questioned my neighbour precisely about this issue and asked what she would do and she said 'Why? It's easy, if the flood comes, I will go upstairs and when the water is gone, I come down again.'*" (P11) (Table 4.2). Only one informant (a New Wilhelmsburger) reported going to her neighbours during a flood warning to tell them to prepare - "*And I went to the neighbours and I told them, you have to pack your bags.*" (P10), she lives in

Moorwerder in the south which is still a farming area and situated on low-lying ground so is often put on alert during storm surge events.

Table 4.2 Sources of community interaction and informants' impressions from interactions and messages. The final column presents the Author's impressions[18] of the characteristics of flooding in community interactions.

Sources of interaction	Informant's impressions from community interactions & messages	Author's impressions of the characteristics of community interactions
• Old Wilhelmsburgers: o '*Elderly German people'*; o *'Contemporary witness'*; o '*Survivors of the 62 flood'*; • Neighbours. • Family. • Friends & peers: o Fellow Deichwacht members; o Neighbours; o A guy from a bar; o A friend's father; o Housekeeper/landlady; o Children. • Self: o "*And I went to the neighbours and I told them, you have to pack your bags*." (P10).	• No awareness: o Only a minority know of the threat; o Know nothing; o Do not know. • Awareness in certain groups: o In German mindset; o The [Old-] Wilhelmsburger knows; o Foreigners/immigrants do not really know; o Its an old person's story, not a young person's reality; o New people are unaware. • Awareness is on the rise: o With the 50th year anniversary. • No interest: o People aren't interested; o No young person is really interested; o Not a topic thought about; o No consciousness about the problem [flooding].	• Doesn't come up in local conversations. • Comes up when there is an event. • Not flooding, but the dikes come up in conversation. • Not urgent; • Not intimate/personal or 'owned'; • Not sort after.

(Extended version, with supporting excerpts available in Table B.4).

Student's reported receiving information from a range of sources (Figure 4.6); including conversations with 'a guy' in a bar concerning conspiracy theories to do with the dikes - "*A guy told me, in the Soul Kitchen* [local bar & social club] *actually. We were talking about this. The dike thing. I mean, I don't know if it's true or not, I mean could be totally made up. I mean there are kind of conspiracy theory all the time, no. But even though, it's imaginable, don't you think?*" (P12) - with Old Wilhelmsburgers or their landladies ('housekeeper') (Table 4.3). Students do not appear to be seeking the information out simply

[18] Based on the Author's interactions with informants in general, experience and analysis of the data, and time spent in the different case sites.

picking it up as they interact with different residents, they are not necessarily interested in the current topic of flooding, and do not find themselves talking about it often (Table 4.3).

Table 4.3 Community interaction: sources of information for each group reported in informants' interviews

Categories	Old Wilhelmsburger	New Wilhelmsburger	Student	Immigrant
Sources of interaction	• Personal knowledge; • Parents taught them; • Parents informed; • My mother-in-law; • My husband told me; • My friends and neighbours and I know; • Parents history; • We [the Deichwacht] are here.	• Talked with old Wilhelmsburgers; • Questioned Neighbours; • Told neighbours; • Neighbours told me; • Tour organisations; • "*But everything I know is second hand and not from any close relative or friend*."	• '*A guy told me'*; • '*An old lady who survived the flood told me'*; • Spoke to old Wilhelmsburg people; • My housekeeper told me.	• Fathers friend from the Deichwacht; • My children talk about it.
Impressions from interactions & messages	• Old-Wilhelmsburgers know; • Foreigners not aware; • Little conversation until their is an event; • My mother-in-law was always afraid of flooding; • People not interested in flooding.	• In German mindset; • Not in immigrants' mindset; • Not in local conversations except when there is an event; • Topic increases as we get nearer 50 years.	• No one in our generation thinks about it; • No body worries about flooding; • Do not know anything about it; • Haven't talked to anyone about flooding.	• Haven't heard much from Behörde; • Only talk about it when there is a flood somewhere.
Attitudes	• Not afraid, dikes will protect us; • *'old people's stories. So it's not young people's realities*'	• Not really so interested in the topic.	• Never concern myself.	• Haven't planned maybe those who went to school here are better informed.
Descriptors of	Personal, related, knowledge	Semi-personal, seeking connections.	Impersonal, distant, random,	Semi-personal, being taught by

Categories	Old Wilhelmsburger	New Wilhelmsburger	Student	Immigrant
community interaction around flooding for the different groups	passed on (children taught), inside		informative, conversational	children, close-knit

Interestingly an immigrant informant was the only one to mention hearing about flooding from his children, who study the topic one week a year, and during that week there is active conversation about it in his home - *"my children heard as well. They also learned much in school. Every year they talk about this topic for a week or more."* (P22). Children and friends or peers were the sources of community interaction reported by immigrant informants (Figure 4.6). An Old Wilhelmsburger who is a teacher in a local school in Wilhelmsburg, described how flood awareness lessons are apart of the local curriculum, however, she wasn't sure if all teachers did include it in their lesson plans - "*In the primary school it's always a topic in the social sciences and then of course they talk about the storm surge, about what happened. What can happen if the Elbe rises? Why do we have dikes? What do we have to do if the water overtops the dikes or the dikes break? That's in all primary schools once in a while an issue...I don't know if every teacher is doing this, but usually you do this in this area*" (P14).

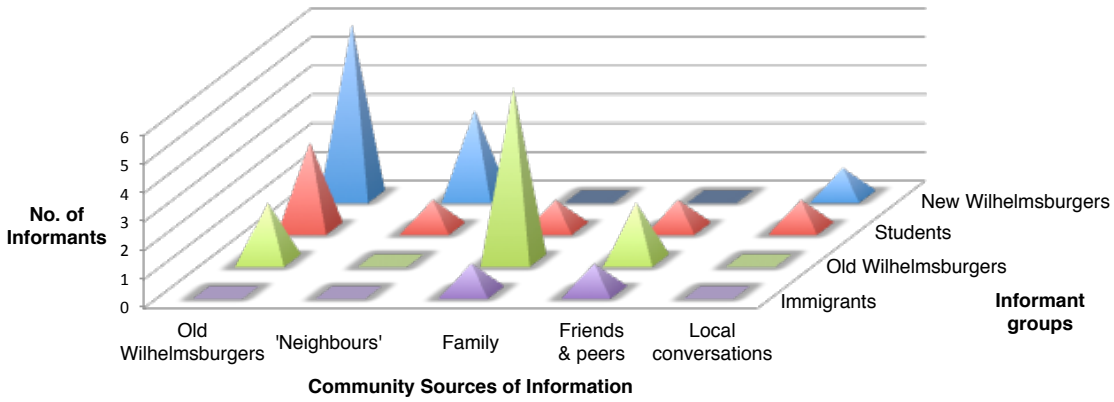


Figure 4.6 Sources of community interactions involving discussions regarding 'Flooding' or 'flood defence' in Wilhelmsburg, reported by the different informant groups.

In terms of what informants have gathered or interpreted from the verbal conversations they have had and from living on the island, it appears that most do not consider it to be a very prevalent topic of conversation (Table 4.2). It's a topic that only really comes up in response to an incident or event that raises it (e.g. floods elsewhere in Germany or the world, the preparations of the 50th year anniversary of the 62 flood). Informants perceive there to be little awareness among residents in Wilhelmsburg, especially among 'new comers', 'foreigners', and 'young people' (Table 4.2). They do not see many being interested in the topic of flooding or potential flooding (Table 4.2). Places where awareness is still perceived to exist is in 'the mindsets of Germans' and among Old Wilhelmsburgers (Table 4.2). One mature student saw there being a rise in interest in the topic, with the approaching 50th year anniversary of the 62 flood, but otherwise its not a topic that comes up much -"*Actually I think it's like a rising awareness thing until next year* [50th anniversary of 62 flood, 2012]*, but when I came here... in the beginning it was not a topic at all. And it just started during the last 1.5 years. That it was a topic.*" (P24).

The lack of interest in flooding was mentioned by all informant groups (Table 4.3). Students in general implied that they were not worried about flooding so didn't find themselves talking about it, immigrants suggested that they hadn't heard much about it from the Behörde (authorities), and both Old and New Wilhelmsburger saw immigrants as a group with very little awareness, and young people as just not interested in the topic (Table 4.3). As one Old Wilhelmsburger put it - "*It's old people's stories. So it's not young people's realities I think*." (P28).

It appears that although undertones of awareness are present among the residents of Wilhelmsburg there is no active dialogue around the topic between community members. Most of what dialogue is taking place is occurring among Old Wilhelmsburgers (between family members) or between Old Wilhelmsburgers and the other groups. Unfortunately, the number of Old Wilhelmsburgers with direct experience is decreasing as survivors of the 62 flood get old, move or pass away. This means that in time unless another local

source of community-based verbal information is established on the island, the depth of detail available about how a flood could affect Wilhelmsburg stands to diminish. The lack of conversations and interactions around flooding in Wilhelmsburg creates an attitude of 'I do not need to worry', which is propagating the lack of verbal interactions and creating a spiral where communication about flooding in the different communities is becoming more and more subdued.

Organisational Interactions

Organisational interactions, involve those interactions between local residents and organisations. This includes:

- Awareness communications published and distributed (via the post, in local newspapers, or online) by the local authorities or the Deichverband (Dike Association) to help build local awareness of the flood threat;
- The city's initiatives to get people involved in their own need for preparedness (e.g. workshops, evacuation drills, information booths or displays); or
- Interaction with research endeavours (e.g. workshops, data collections - interviews, reports, books, conferences) (Table 4.4).

Figure 4.7 shows all the reported sources of organisational interactions that informants mentioned in their interviews. Table 4.4 summaries these into the most prominent examples.

The primary organisational interactions described by informants was with the Behörde[19] (the local authorities) through their distribution of a 'Sturmflut' (storm flood) pamphlet that informs residents on what to do, where to go, and how to prepare for a flood (Figure B.15a,b,c). In fact 22 of the 28 informants interviewed mentioned this pamphlet as a source of information from the Behörde (Figure 4.7), the rest said they didn't know about it, hadn't received one, or probably had thrown it away with other advertisement from the city. A common point that was raised amongst informants was that only the German

[19] Which authority was seldom specified or identified by informants. 'Behörde' was used in reference to the collective body of authorities responsible for providing protection from flooding.

version of the pamphlet was distributed, and that they believed alternate translations were available but they had never seen one. This they pointed out could be a concern because many of the immigrants (especially Turkish & Muslim Women) could not speak German.

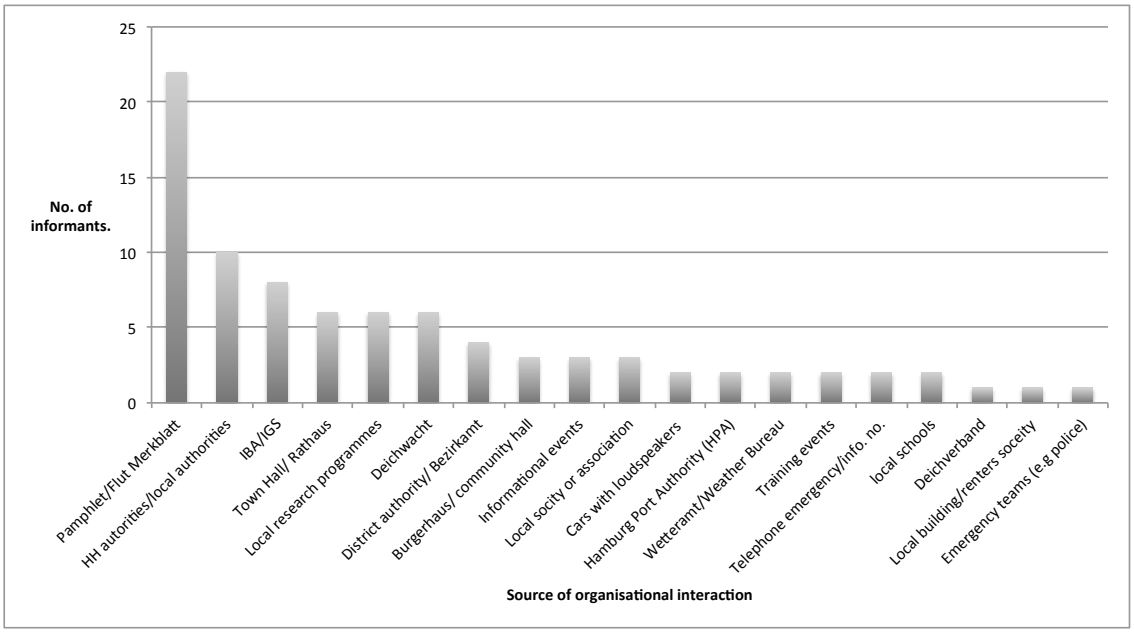


Figure 4.7 Sources of organisational interactions involving discussions regarding 'Flooding' or 'flood defence' in Wilhelmsburg, reported by different informants.

It appears from the range of organisational interactions, that organisations are viewed as actively trying to keep residents informed of the flood situation and legacy. Documentary evidence supports this view, as documents concerned with increasing flood awareness and promoting a flood-culture were identified and where possible collected. This evidence revealed a number of information pamphlets and sources designed around promoting flood preparedness awareness in Wilhelmsburg (see Appendix B1 for descriptions of these awareness endeavours). It should, however, be remembered that the sample of informants interviewed for this study is not necessarily representative of the communities of Wilhelmsburg. This sample consisted of those individual who were already interested enough in the issue to want to participate, so it would be expected that a level of awareness about the flood issue and the organisations involved would exist. Whether this is the case for other

communities (i.e. the non-German speaking immigrants, Turkish women, and minority cultures) is unknown.

The interpretation informants gave regarding these sources of interaction was that the Behörde were well prepared and that information concerning the flood risk to Wilhelmsburg was available, however, it was up to the residents to get it and inform themselves (Table 4.4). This perception of preparedness brought comfort, and had the implication that they didn't feel much need for them to do anything - "*We have good personal that look for the dikes. I'm sure we are on a good way and I'm not afraid at all that Wilhelmsburg have a problem.*" (P20).

Table 4.4 Sources of organisation interaction and informants' impressions from interactions and messages. The final column presents the Author's impressions of the characteristics of organisation interactions.

Sources of interaction	Informants' impressions from interactions & messages	Author's impressions of the characteristics of organisational interactions

• The Behörde (Authorities)/the City:
  ○ Sturmflut pamphlet;
  ○ Siren warnings.
• IBA/IGS:
  ○ Workshops;
  ○ Participation events.
• Emergency teams:
  ○ Loudspeakers;
  ○ Door knocking;
  ○ Police.
• Local organisations:
  ○ Deichwacht;
  ○ Deichverband;
  ○ Tour organisation.
• Local community venues:
  ○ Buergerhaus (Community hall).
• Research Organisations:
  ○ Dr. Pasche TUHH.
• Information & training events:
  ○ Emergency drills by the Deichwacht, or emergency response crews.
	• The Behörde are prepared:
	  ○ Have evacuation plans;
	  ○ Are monitoring & checking the dikes;
	  ○ Well through-through system of dikes;
	  ○ Raised the dikes;
	  ○ Send out information materials;
	  ○ Installed meeting points;
	• Unsure about the Behörde's plans:
	  ○ IBA house plans did not include flood defence mechanisms.
	• The Behörde provide info. it's a resident's responsibility to find it & info. themselves:
	  ○ Must get you own information.
	• Deichwacht not as strong as in the past:
	  ○ Volunteers have no real flood experience;
	  ○ They couldn't find a new office.
	• Haven't heard much:
	  ○ I didn't much…
	• Sturmflut pamphlet 'yes, but':
	  ○ Do not know where it is;
	  ○ Like other advertisements from the city I through it away;
	  ○ I do not know it;
	  ○ Can't read German;
	  ○ Once a upon a time I read it.
	• The Behörde do not want to inform residents they want to sell land:
		• Available;
		• Accessible;
		• Taken care of;
		• Organised;
		• Reliable;
		• Calculated.

Sources of interaction	Informants' impressions from interactions & messages	Author's impressions of the characteristics of organisational interactions
	○ The want people to buy flats and houses on the island.	

(Extended version, with supporting excerpts available in Table B.4).

Interestingly several informants suggested one or two interactions that had caused them some concern. A New Wilhelmsburger mentioned how his participation in an IBA participants' workshop had left him feeling alarmed, when the chief architects involved in the IBA project told him that they were not considering flood adaptations in the designs of the houses they were building. He felt that this implied that the Behörde who were working with IBA, didn't feel any need for flood protection in the new buildings being built in Wilhelmsburg - "*Well I mean, the Behoerde is also IBA. IBA is setting the benchmark and when the IBA says 'No protect', when IBA says no protect, the state Hamburg says, 'Don't need protect. The dike is high enough, or not don't know.*" (P18). A similar comment was made by an Old Wilhelmsburger who had attended one of the awareness workshops put on by the TUHH[20] and presented by the late Dr Erik Pasche. During this workshop Dr Pasche explained about the flood risk to Wilhelmsburg and presented different structural adaptations that could be used to help protect private dwellings and local building from flood damage. This informant, however, had observed that 'people' had this knowledge and technology but were not implementing it in new buildings - "…*people listened to that* [Dr. Pasche's talk] *and then said 'perfect', and in the next year they built a house and put the whole stuff in the basement again* [husband]" (P6). Another informant felt that given the current needs for space and vision for Wilhelmsburg, the Behörde do not want to increase flood awareness as that could alarm potential investors and stop people from buying property on the island - "*I think the city has no interest to make them aware of it, because that would make people think more about this place. So they* [the city] *show, 'buy flats', but not think too much.*" (P28). Lastly two informants mentioned the difficulties that the Deichwacht have been having in getting volunteers and a

[20] Die Technische Universität Hamburg.

new office. One felt that what volunteers they do have now, have had no real flood experience, and their effectiveness in protecting the dikes during storm surges, compromised. All of these points highlight that there is some concern amongst some informants (mostly Old Wilhelmsburgers) of the flood defence in Wilhelmsburg and how it currently stands.

Organisational interactions appear to be diverse, and active in providing information on flooding and its risks to residents. The message that appears to be reaching informants is that the city authorities have flood defence under control, and there is little need for residents to be concerned or doing anything for themselves.

Media Messages

For most of the informants the internet is seen as their main source of information (Figure 4.8), and by and large they believe that it would be able to provide them with any information they needed to either respond during a flood event, find out how to prepare beforehand, or learn about what happened in the past. Radio had the second most informants mention it as a source they have or would use to gain information about a flood situation in Wilhelmsburg (Figure 4.8). It did not seem to the author that either of these sources of media information had been used to find out information on preparing for floods, more for finding out what the risk is to the island and what happened in 1962. However, unless a flood does happen, it is possible that there has been no interest in the topic and hence no perceived need to seek this information. Informants did say that during the bomb evacuations in Reiherstieg, the radio had been an important source of information as to what was going on and what they needed to do[21].

The other media sources mentioned by informants are shown in Figure 4.8. Six main messages appear to be being received by informants from these sources:

1. There is still some awareness about flood risk out there;

[21] The radio is described as being of use during an emergency situation, less so as a media source prior to a flood event.

2. The dredging of the Elbe is a concern, as it could increase storm surges;
3. Climate change's effects on flooding are something to be concerned about;
4. The city's flood defence has improved dramatically since 62 as demonstrated by the lack of impacts associated with the 76 and 78 storm surges;
5. The ability to get information to people has improved since 62; and
6. 2012 is the 50th year since the 1962 flood, and Wilhelmsburg will be putting on anniversary events (Table 4.5).

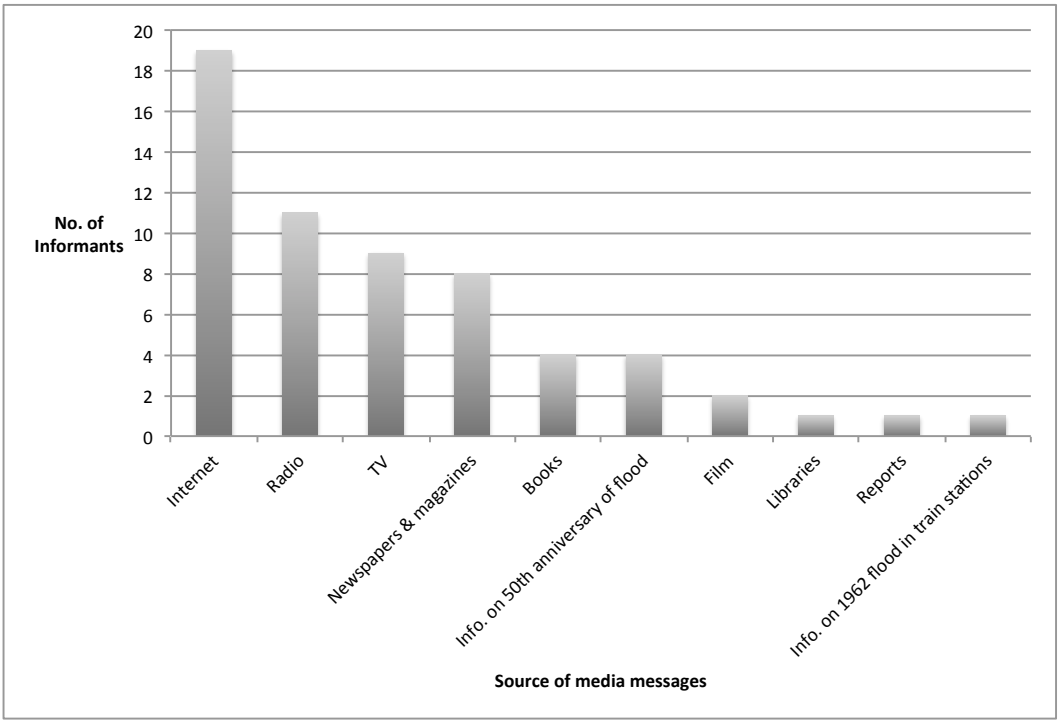


Figure 4.8 Sources of flood information from media messages in Wilhelmsburg.

Table 4.5 Sources of media and informants' impressions from interactions and messages. The final column presents the Author's impressions of the characteristics of flooding in media messages.

Sources of interaction	Informants' impressions from interactions & messages	Author's impressions of the characteristics of media messages
• Radio: ○ Listened to in times of emergency; ○ Broadcasting news on the 50th year anniversary. • Internet:	• People still thinking about the flood risk: ○ Some awareness still exists. • Dredging of Elbe a problem: ○ Makes the tides bigger; ○ Increases the flood threat. • Climate change a concern: ○ Climate change problems solvable with our technology;	• Informative; • Historical; • Documentary; • Monitored.

Sources of interaction	Informants' impressions from interactions & messages	Author's impressions of the characteristics of media messages
○ Used in times of emergency; • Newspapers & Reports: ○ Printing news on the 50th year anniversary; ○ Investigate flood defence plans & improvements; ○ Printing news on IBA-community interactions.	○ In the next 20 years the sea level will increase & Wilhelmsburg must be prepared. • The flood defence improved & improving: ○ 76 & 78 storm surges bigger than 62 & a problem to Wilhelmsburg. • Better media culture today than in 62: ○ Since 62 there is more chance of us being informed. • The 1962 flood & its 50th Anniversary: ○ Its next year (2012); ○ The flood was a huge catastrophe; ○ Is in social memory of Hamburg; ○ Increased talk about the 50th anniversary.	

(Extended version, with supporting excerpts available in Table B.4).

Having access to the internet and other sources of quick information like books, films and TV, that can be accessed by the informant on their own at their own convenience appears to empower informants and bring a significant level of comfort. Of course such actions are ultimately dependent on interest or need. Current media messages appear to be satisfying the level of interest amongst informants, without creating any urgency or need for [more] action. In addition, the impression of media messages as 'sources' of information on flooding and not 'mediums' of messages from 'sources', may also eclipse the need informants have of determining who is responsible for what, and from whom the different messages are being put out. This has implications for informants' ability to know the accuracy (i.e. out of date, from none knowledgeable source etc.) of the information they are obtaining from media messages.

4.3.2 Observational learning sources

Observational learning sources are those that are witnessed by the person themselves and hence add to their learning. These sources can include: environmental clues, memoria, indirect experience and media images[22] (i.e. live reporting on TV or film of flood events and their impacts).

[22] Media images were not mentioned by informants so could not be included in the analysis.

Environmental clues

Table 4.6 lists all the environmental clues identified from informants' responses, and Figure 4.9 shows how many informants mentioned each environmental clue, and provides an indication of which clues are most prominently recalled by informants.

Table 4.6 Summary list of Environmental clues mentioned by informants. The final column presents the Author's impressions of the characteristics of flooding in environmental clues.

Environmental clues	Author's impressions of the characteristics of Environmental clues
• Flood defence structures & events: o Bus stop gathering & collection points; o System & height of dikes; o Annual siren warnings; o Home built on a [*Warf*] mound; o Emergency preparedness drills; o Family built an upstairs to avoid another flood; o Flood gates; o Prepared (pre-filled) sandbags. • Situational clues: o Being on an island; o Being surrounded by water; o Nothing has happened since 1962; o '*Wettern'* [small drainage canals]; o Wet basements; o Living in a lowland area; o Container storage on Wilhelmsburg. • Weather clues: o Changes in climate; o Thunderstorms act as warnings. • Evidence of past flooding: o Old furniture has flood damage marks; o Flood damage marks on walls in rooms.	• All around; • Well engineered; • Situational; • Historical.

(Extended version, with supporting excerpts available in Table B.5).

In terms of flood defence structures and events, the dikes are the most mentioned environmental clue that hold meaning associated with flooding and flood defence, they are the only environmental clues that were mentioned by all informants (Figure 4.9). It is not surprising that the dikes are such a recognised sign of flood defence in Wilhelmsburg, as the island's existence depends on them, and travel to and from it will take you over them - be it by train or road (Figure B.23). In addition, the word 'Deich' is evident on road signs that mark out old and new dikes (Figure B.25), and in the names of local businesses like the hairdresser on Vogelhüttendeich Street shown in Figure B.25 (image 25) called 'Deich Friseur'.

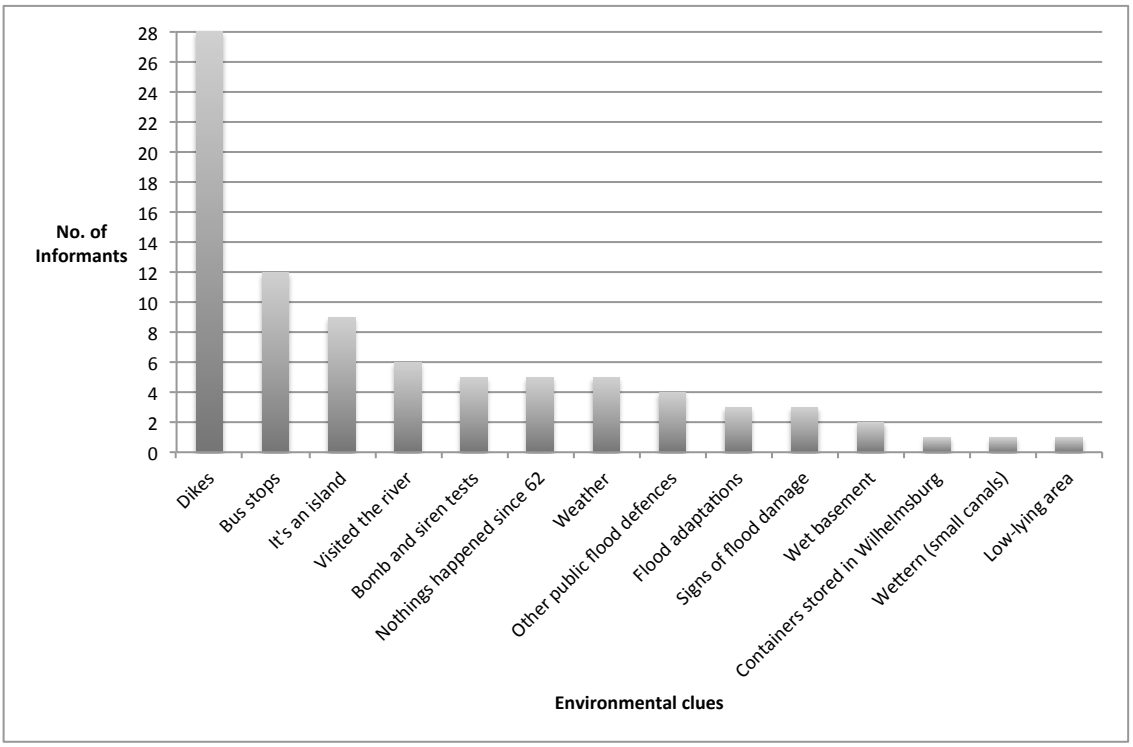


Figure 4.9 Environmental clues recalled by informants.

Other mentioned flood defence structures included the bus stops that indicate gathering points during an evacuation, the annual siren warning tests, witnessing the emergency dike defence drills (by the Deichwacht, Deichverband and emergency agents), flood gates, and the pre-filled sandbags that Wilhelmsburg has prepared (mentioned by the leader of the Deichverband) (Table 4.6). In addition to these, two Old Wilhelmsburgers mentioned more personal flood adaptations that held flood defence meaning to them. The first is an elderly lady who has lived her whole life on the island; she was born in 1941 in a house that was built on a *Warft*[23] (Table B.5). Some of these houses still exist in the more rural areas of the island, as was relayed to the author through discussions with residents (pers. comms, 2011), however, when pointed out to the author, she found it difficult to identify they were on mounds. The second lady was only a child during the 1962 flood (born in 1960), however, she to has lived on the island all her life, and she recalls clearly that her mother-in-law had rebuilt her house after the flood with a second floor, so that she would never

[23] A raised mound used historically to keep homesteads above tidal or flood-waters.

have to get stuck on a ground floor in a flood again - "*My mother-in-law…when she rebuilt again, the house had to have stairs so that she didn't have to live on the ground level, she was always afraid of flooding*" (P14).

The bus stops that are marked as gathering points during a flood were the second most mentioned environmental clue (Figure B.27) (Figure 4.9). These are mentioned within the Sturmflut pamphlet as well as being present within the environment of informants, so some of the awareness of them may be attached to information received through organisational interactions. The multiple receipt of information, and forms of learning (visual, reading, kinaesthetic, experiential) of both the dikes and the bus stops are likely to be reinforcing the awareness of these structures in the local environment and to varying degrees (depending on the person) their purpose.

In terms of situational environmental clues, informants mentioned 'being on an island' (Table B.5), and 'visiting the river' most frequently (Figure 4.9). This latter clue included having:

- Visited the river during a storm surge to see how high it was:
  - "*And I'm not afraid about the flood. I'm not afraid. For nearly 10 years there was a very big flood and I go to the dike and then there are many police and security and THW and then the water was about 40cm under the dike crown. It was then 2 years later the dikes are getting higher and now they are 70cm higher*" (P10);
  - "*Ridiculous in the sense that there is such a force passing by and you're standing there on the the dike that's supposed to protect you and it's just nature, the force that nature can show, it's nothing…Yes, yes. I was there. And then basically the water goes right up to your feet.*" (P17);
- Going to see where the north and south Elbe meet in Moorwerder:
  - "*Well in Moorwerder, yes there where the northern and southern Elbe are. I look at this. The Elbe goes like this and this and goes back together. In the direction of Harburg, I went there quite often. By car of course. Not by bike, not anymore. But I get out and look out. There a lot*

of field in front of the dike where the water runs and has space, so it doesn't go up so high." (P4); or

- Through involvement in the Deichwacht or Deichverband.

These visits are experiential and can carry lasting impressions regarding the nature of the river. In addition, visits like these represent observational interactions where more than just the dikes are being observed. They help to reconnect in the minds of the informants the relationship between the dikes and river. This relationship brings awareness of what is happening behind the dikes and the role they play in keeping the river out.

Other situational environmental clues included (Table 4.6):

- Being surrounded by water (connected to awareness of being on an island);
- Having observed that nothing more has happened since 1962;
- The Wettern (the small canals that help drain the island, and acted as an access point to the flood waters during 1962);
- Wet basements;
- Awareness of living on low-lying land; and
- The concern that the containers from the harbour stored on the island might be a source of damage if a flood should occur - "*There is a container storage close to Wilhelmsburg and I just would be afraid that because of the flood containers will become loose and would be transported over the whole island. And if such a container hits a house, I don't know what would happen.*" (P11).

Informants who spoke of the 'weather' as an environmental clue that held meaning relating to flooding for them, included those who had lived through the 1962 flood and still felt cautious during thunderstorms that signaled to them a potential storm surge (Table B.5). One New Wilhelmsburger had been a maritime engineer, and still carried an appreciation for the warning weather conditions can give you regarding storms and their conditions. Another New Wilhelmsburger suggested that he was aware of different weather conditions on Wilhelmsburg, and that these reminded him that he was living near the North Sea. One Old Wilhelmsburger couple suggested that they had observed the

changes in weather on Wilhelmsburg over the years, and that they were already feeling the effects of climate change.

Lastly informants described places where evidence of the flood damage caused in 1962 can still be seen. One mature student (aged 43) pointed out that there had been flood damage evident on the walls of a house she stayed in (Table B.5). An Old Wilhelmsburger was able to show the author during her interview an old bookcase and wardrobe that had been her mothers, which still showed the level the water came up to in the wood, and had water damage on the back (peers. comms during an interview not recorded, 2011).

Environmental clues that speak of the flood history, flood threat, or flood defence of Wilhelmsburg are plentiful and diverse. These clues are playing an important part in maintaining a level of awareness amongst informants - hopefully residents in general.

Memoria

Memoria act as environmental clues in that they are symbols in the environment that carry a meaning and message associated with flooding. However, this meaning is specifically related to flood history in that they act as symbols of remembrance for the flood history of the island. Flood defence is an innate part of flood history, in that recognition that it failed is most often the cause of a flood, or alternatively that is was effective and a big tragedy was averted (more specific to old stories and songs). Table 4.7 lists the memoria that informants could recall from their lives in Wilhelmsburg, and Figure 4.10 shows how many informants mentioned each memoria, and provides an indication of which structures are most prominently recalled by informants.

Table 4.7 Summary list of Memoria mentioned by informants. The final column presents the Author's impressions of the characteristics of flooding in memoria.

Memoria	Author's impressions of the characteristics of flood memoria
• 1962 flood marks. • 1962 wave memorial. • Elbinsel Museum. • 50th Anniversary of 1962 flood preparations. • History books - autobiographies, biographies, etc. • Local folklore. • Old stories & songs. • Roads names for old dikes.	• Historical/dated; • All around; • Easy to over look; • Cultural.

(Extended version, with supporting excerpts available in Table B.5).

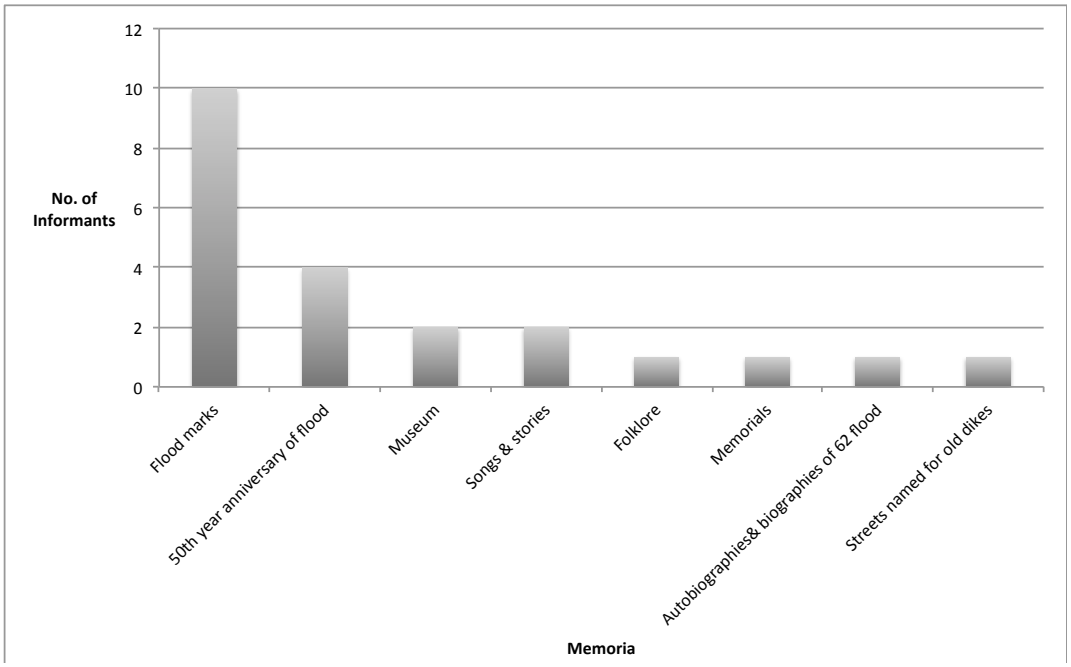


Figure 4.10 Memoria in Wilhelmsburg recalled by informants.

One New Wilhelmsburger said during his interview "*You can see the history of floods, when you go through the streets*." (P13). Although he was specifically referring to the street names being named after old and new dikes, his words presents a good description of the effect of both the street names[24] and the flood marks on the walls around Reihersteig. These flood marks show the height the water came to in that area during the 1962 flood (Figure B.22) and not surprisingly were the most recalled memorial initiatives by informants (Figure 4.10). It is suggested by the author that these marks are one of the

[24] Requires some degree of extra awareness to recognise their historical significance.

most significant awareness devices left in Wilhelmsburg, and their presence acts as a good reminder of what was and what might be again. However, it was observed by the author that these marks do not garner much attention by passer-bys on the streets, also they are quite small and easily overlooked, the author herself found it quite difficult to find many of them. Additionally, several of the marks were eclipsed by local graffiti on the walls making it even more difficult to differentiate them[25].

2012 marked the 50th year anniversary of the 1962 flood and while undertaking the interviews in 2011 several informants mentioned an increase in dialogue around this anniversary, and the moves by the authorities to prepare for this event. One mature student commented on how since arriving in Wilhelmsburg (1.5 years before), she had noticed that community interactions included more conversations about the flood, with the preparations for the 50th anniversary (Table B.5). In this regard at the time of interviewing, memoria around the 50th anniversary was more verbally based, and included in community, organisational and media interactions, and none could be observed by the author during her time in Wilhelmsburg. Although strictly speaking this would make this a part of community or organisational interaction, the author included it under memoria as it was expected at the time that it would result in some long-term environmental memorial post 2012, so in expectation of this the author included. Unfortunately, in a more recent visit (2013) to Wilhelmsburg, post analysis, the author could not find any such memorials, nor any real evidence of the anniversary at all in the environment. She subsequently suggests that it's likely that currently it is no longer an active part in either verbal sources or environmental SOI in Wilhelmsburg.

Another part of local memoria mentioned by two New Wilhelmsburgers was the Elbinsel Museum, that shows how the island has evolved with changing dike layouts and provides pictures and information on the 1962 flood. Memoria that

[25] In a more recent visit in 2013, much of this graffiti was observed to have been cleaned off the walls, most likely in preparation for IBA and the International Garden Show.

held flood meaning, but not necessary specifically to Wilhelmsburg, were aspects of local culture like stories, songs and folklore (Table B.5).

Although informants demonstrated awareness for aspects of memoria in their environments, the author got the impression that these no longer played much of a role in informing residents of the flood risk.

4.3.3 Indirect Experience

Indirect experience involves the witnessing of an event and it impacts without being directly involved. This may involve seeing it and/or being told about it by survivors who can pass on the sense of the fear they felt, or who can cause a sense of shock in the listener from their imagining of what it might be like to have experienced something like that. It can also be through the experience of events that are seen as similar or to have similar characteristics to a flood situation.

Table 4.8 shows the main categories identified within the theme 'indirect experience'. These three 'experiential' categories were observed to be used by informants as 'filters' to assess the threat of flooding and possible outcomes should a flood occur. They included:

- Previous experiences with calls to evacuate or prepare for potential evacuation because of large storm surges;
- Indirect experience that included discussions with neighbours, friends and/or family who had direct experience; and
- Recent calls to evacuate parts of the islands due to the need to defuse Second World War (WW2) bombs that are still being discovered in the area.

Table 4.8 Informants' assessment of potential events (in the case of another flood), based on aspects of flood or disaster related experienced e.g. warnings or emergencies; bold sections indicate lessons learnt from experience, bold & underlined indicate event that was used to provide reference for their current assessment or thoughts.

Category	Informants' quote
Previous call for flood evacuation	• "*Well I always think that the people are quite well informed about where they have to go. We have certain places. We have to go to a bus stop. I have already packed the bags. The last time, we just had moved in a new flat, the last time 7 years ago. They had an evacuation…They said, they said, the flood would further rise and they would, they would kindly ask us to prepare to be evacuated. We lived through that. But actually I went to the dike and the water wasn't as high as the first time and I wasn't afraid*" (P10); • "*In 2006 I was in Cologne. I went there on my own. There was a storm surge and there were warnings* ***and my German neighbours helped my family upstairs, everyone does that***" (P22).
Indirect experience from discussions	• "*Yeah, well****, we heard there was****… of old people mostly dying and people being rescued, pulled out of their houses. I know that people, more in poor living quarters, I mean it was also post-war it was still something, not everything was up to scratch, and well the 60s was it still underdeveloped from today's conditions, undeveloped. Also a gypsy village was also badly affected. And you can see everywhere the marks people have on their houses 1962, which water level, were the water was*." (P2); • "*For many of the elderly people, for the old/elderly German people here, the flood is still, and that was for me and that was amazing, the flood is still so present in their memories [laughter] they can, they could tell me,* ***they were able to tell me details:*** *smells, sounds. It was amazing.*" (P3); • "*Because I know that was really, this is* ***something I met lots of people that were living here with the flood in 62.*** *The worst thing was that they didn't have anything to drink. Ja, water is important*" (P7); • "*I myself wasn't there, I was on holidays, but* ***I can tell about my parents, about my siblings and my girl friends. I asked them how they experienced it*** *and it started in the night and I have a girl friend who lives here down the road. There the house was flooded until the roof but they were during the night, neighbours had woken them up. And the father put the children in the car, the water went already to the doors of the car, and they drove away to Veddel. And on the opposite side, they have also seen this, a woman with her baby went on the roof and slipped down and drowned in the water*." (P25).
Bomb evacuation/s	• "***After I saw that with the bomb****, I mean come on, they [the authorities] went around with a car. They announced in German and Turkish, and another language that I didn't know that what was happening.* ***So I think, when a flood is about, you know, they are quite early and not so late anymore. They would do the same thing, go around with the car and announce...well if people react the same way…"*** (P1); • "***There was a bomb threat here****. They were clearing a bomb, second-world war bomb here, and as a reason the whole area had to be evacuated – when they were diffusing the bomb. And you could see, that they [the residents of Reihersteig] were all sitting in the park there and there was something kind of****... people who usually don't meet or don't talk to each other kind of had a common experience and were talking with each other.****"* (P2); • "*More often and also if the people from the loudspeaker cars go along the streets, they should do it a bit more intensely, very loud and screaming****. Because if you're back there, the people in general sleep back there, don't notice anything…Yes, when they had the unexploded bomb here, it was like this.***" (P4);

Category	Informants' quote
	• "*First of* ***all there's probably lots of people that don't know what's happening, because I remember when we had this bomb thing they****… they* [the authorities] *went around here and announced with loudspeaker but only in German and in Turkish. They didn't even to English or French, which would have been smart because all the African people speak either English or French. That would be a smart move for instance. So there was lots of people that didn't know what was going on. So I don't know, I think there would be lots of people that don't know what's going on*." (P7); • "*It's actually interesting, because we never kind, well we heard kind of sirens alarm,* ***this is usually when they find a bomb and when they have to evacuate the area****, which is everybody does like 'Uhh, again, shit.'* ***And that in general never really*** *works, so the police is going from door to door to get the people out. But the people usually only speak English, there is never a Turkish police officer for example, who can really talk to the people and most people…*" (P12); • "***They [*****the residents of Reihersteig]*** ***would remain sitting here. Was it April or May, …in May… they found a bomb here.*** *They found a big bomb here. It took them 4 hours to evacuate the people, because they always came back. All those drunks at the corner shops. They said 'What do I care about a bomb?'*" (P18); • "***In comparison, we had the defusing of a bomb****, a quarter of a year ago or something. And I didn't notice anything of it. Anyway they locked down the whole district and went by in police cars and through loudspeakers told the people to stay in their houses and so on. I felt like, in those situations, I'm hardly afraid and I thought, it's enough in terms of information. It somehow reaches you in the end.*" (P19).

In terms of the first category one informant indicated a boost in confidence in regards to being well informed in the event of an emergency or evacuation. This was identified through her description of her past experience with a flood evacuation warning in which she went as far as having to prepare a bag in case they had to leave (Table 4.8). Another informant indicated confidence in his neighbours to provide support and a place to stay (in an upper floor flat). This was related to his experience of their actions in previous flood evacuation warnings where he was outside of Wilhelmsburg at the time, and his neighbours helped his family to move upstairs in case there was a real threat (Table 4.8).

Indirect experience from discussions with survivors increased awareness of the historical conditions under which the 1962 flood prevailed, and awareness of the impacts of the flood on the people who lived through it. This awareness provided informants with a means to compare the conditions that led to the 62 Flood with those that exist today e.g. condition of the dikes. These comparisons are used by informants to judge the likelihood of the 1962 events;

as well as the potential severity of these events should they unfold in present day situations.

The last category involved experience with evacuations due to the defusing of WW2 bombs (Table 4.8). These experiences are used by informants to assess the likely actions taken by authorities and their preparedness - "…*So I think, when a flood is about, you know, they* [the authorities] *are quite early and not so late anymore…"* (P1). Alternatively the events of these bomb evacuations act as points to assess likely community responses either in terms of being able to rely on each other "…*people who usually don't meet or don't talk to each other kind of had a common experience and were talking with each other…"* (P2), or the likelihood that there will be confusion or significant problems during an event "*They [*the residents of Reihersteig*] would remain sitting…"* (P18).

4.4 Outcomes of SOI in Wilhelmsburg

Historical awareness and reliance on public protection are considered in this study to be indicators of the extent to which information has reached informants. As such they reflect what information is being received and how informants are engaging or understanding it[26].

4.4.1 Informants' knowledge of the flood history of Wilhelmsburg

It has been established in previous sections that verbal communication with Old Wilhelmsburgers and awareness of memoria like flood marks in Reihersteig are prominent SOI on flood history, however, both have their shortcomings. Old Wilhelmsburgers are becoming less and less a presence in the local environment, and the flood memoria have become so much a part of the local environment they are easily ignored.

When asked about what they know of the flood history of Wilhelmsburg, informants gave information that fell within three main themes (domains see Section 3.4): 'knowledge on flood history' (Table B.6), "implication of the flood"

[26] Coping responses could also be considered an outcome of information, however, as they are ultimately the outcomes of informants' cognitive appraisal processes and protection motivation they are discussed in their own Section (4.6).

(Table B.7), and "causes for the flood" (Table B.8). These themes present the semantic system through which most informants view the topic of flood history. They also collectively confirm, what would be expected given Wilhelmsburg's flood legacy, that this topic is most often connected to the 1962 flood event (Table B.6). During interviews no explicit mention of this event was made by the author, in order to observe what information, relative to flood history, is most cognitively and/or affectively accessible to informants. The manner in which informants responded to this topic, differed relative to their flood experience – most specifically their experience of the 1962 flood. Those with direct experience or connections with those who did experience the 1962 flood directly, gave personal[27] and specific[28] information. Those without this source of awareness responded with far more general[29] and broad[30] answers.

For the basic domain analysis semantic relationships based on the three themes mentioned in the previous paragraph were looked at. Four relationships were identified: 'Resulted from' (causes); 'involved in' (who); 'knowledge of' (what, when); and 'resulted in' (implications). The results for this analysis were put on code plots that were developed within 'floating', coloured spheres. This design was used to illustrate that these codes reflect cognitive and affective thoughts and awareness, as such they are highly subjective, being daily influenced by events in the individual's life and context (hence a 'little up in the air'), and are largely connected to their personal interests, worldviews, and perceptions. Therefore, a design that sort to reflect the historical flood awareness of informants, as well as the intangible nature of this awareness, was developed. Figure 4.11 shows the code plot of the domain analysis for all 28 informants. Plots for the different informant groups are available in Appendix

[27] 'Personal' - Knowledge of individual on-the-ground events, ability to describe or relate to associated emotions that accompanied on-the-ground events, and description of events in present-tense understanding.
[28] 'Specific' - Events in specific locations in Wilhelmsburg, to specific people, implications as they occurred in a specific time.
[29] 'General' - What happened in general, when it happened in general, why it happened in general.
[30] 'Broad' - As it affected the whole of the island, the general population, left long-term social implications for the whole island or even Hamburg.

B (Figures B.16-19). The size of each sphere represents the prominence of the semantic relationship in informants' interview responses. It is important to point out that there was not an even amount of informants from each informant group (New Wilhelmsburgers 10, Old Wilhelmsburgers 9, Students 6 and Immigrants 3) interviewed and 'prominence' of semantic relationship is determined by looking at the number of codes associated with it (i.e. the more associated codes the larger the sphere), however, the frequency of codes (indicated by the 'P'-numbers) is based on the number of informants who had that code (i.e. the more emphasised the code the more frequent the code).

Knowledge about flood history of Wilhelmsburg

Five categories were identified within the theme 'knowledge on flood history'; Box 4.2 lists these categories (supporting excerpts Table B.6). In terms of flood history most know something about the 1962 flood: the year it happened; that it happened; that Helmut Schmidt made a name for himself through his organisation of Hamburg's response to the crisis; that between 100-400 (depending on the informant) lives were lost; causes of the flood (Table B.8) and implications from it (Table B.7). Very few (6) informants spoke of other floods or storm-surge events (i.e. 1974 & 1978), and even fewer (3) could give any information on flooding pre-1962, or describe the part flooding has played in the development of Wilhelmsburg.

Box 4.2 Summary of list of categories identified for knowledge of the flood from informants' responses.

- Do not know;
- Date, time, year;
- Other storm surges;
- [Those] Involved in;
- Locations affected.

(Extended version, with supporting excerpts available in Table B.6).

In Figure 4.11 the small red sphere reflecting the semantic relationship 'knowledge of', indicates the informants' perceptions of their knowledge regarding the 1962 flood. It was selected to include only indication of lack of knowledge in this sphere, as the other spheres innately suggest some. The small size of the red sphere in Figure 4.11, suggests that:

- There is some perception of lack of knowledge amongst informants, but

- That this is not prominent in their responses.

Codes utilised in this sphere, came from New Wilhelmsburgers (Figure B.16), Students (Figure B.17), and Immigrants (Figure B.18) indicating that amongst these groups some informants didn't feel/think they knew anything, or not much about the 1962 flood. All Old Wilhelmsburgers indicated that they believed they knew something of the flood; therefore, no red sphere appears on their code plot (Figure B.19).

Between the different informant groups, more personal and specific accounts were provided by Old Wilhelmsburgers who lived in Wilhelmsburg at the time of the 1962 flood, but also New Wilhelmsburger who lived in Hamburg in 1962 or had taken the time to sit and talk to Old Wilhelmsburgers about their experiences during the 1962 flood: *"… we've talked to eye witnesses"* (P1) (Table B.6). New Wilhelmsburgers who were not alive or living in Hamburg in 1962 and immigrant and student informants tended to provide responses relating to flood history that were not only indirect and broad, but also revealed a general lack of knowledge about the event - "*I hardly know anything about it*" (P17), "*I've no idea*" (P15). Two informants were able to give personal accounts concerning other storm-surge events (e.g. In 1976 & 1978); one an Old Wilhelmsburger whose husband had had to go fill sandbags in 78 - "*In 76 many people were worried… in 78 he* [her husband] *had to go out and fill sand sacks with sand"* (P4), and a New Wilhelmsburger who was living in a Hamburg suburb north of the Elbe - *I remember the floods and I think it was 74, there were a lot of floods in that winter, but I was living in Blankenese"* (P7).

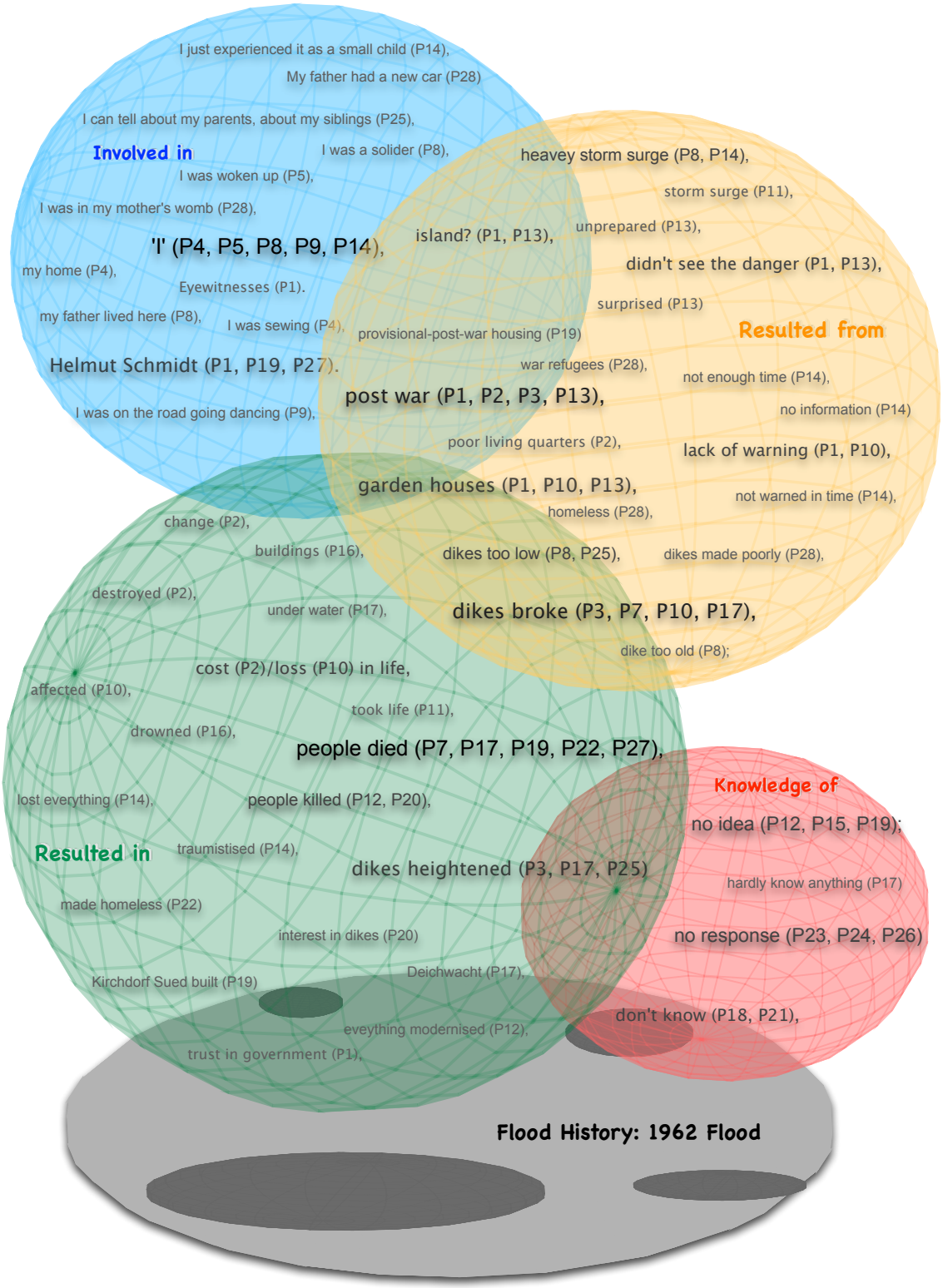


Figure 4.11 Code plots of [all] informants' reported historical awareness, in terms of the semantic relationships: 'resulted from' (causes - green sphere); 'involved in' (who - blue sphere); 'knowledge of' (red sphere); and 'resulted in' (implications - yellow sphere). Size of spheres represents prominence in group (i.e. number of codes). Bracketed 'P' numbers indicate informants who shared the coded point.

The personal and specific accounts of those that experienced the 1962 flood, reflect their involvement in the flood, or their families' involvement (Table B.6). For Old Wilhelmsburgers this is demonstrated through the semantic relationship 'involved in', which, in this group, was the most prominent semantic relationships (blue sphere, Figure B.19). Within this relationship the associated codes all involve personal pronouns ('I was', 'My father', 'My home'). Although many of these informants recalled some traumatic incidents, and described what they or their family did to survive the 1962 event (Table 4.1), none showed any really negative emotions in connection to their experiences. Most appeared to be able to recall what happened with some degree of mirth [author's perception during interviews], however, they also reported still dreaming about it, still being able to remember smells and sounds from the event, and a sense that should it happen again they would be able to survive and help others due to their experience. The informant who lived in Blankensea, north of the Elbe, recalled her experiences with a positive sense of enjoyment: *"We had fun yeah… Because when it happened in the beginning of the 70s it happened so many times it was just like 'ok flood again', everybody goes down and rescues the boats. And drinks beer…"* (P7).

Implications of the 1962 Flood

Figure 4.11 indicates that the 'results of' (implications, green sphere) the 1962 flood are the most prominent associations, these ranged from the damage caused to life and property, to social changes and improvements in flood defences (Box 4.3). Implications of the 1962 flood were prominent in the responses of all informant groups, however, they appeared most prominently from Immigrants and Students. These groups appear to associate this semantic relationship the most with flood history of the island (Figure B.17 & 18, Table B.7). This could be because these aspects of the flood hold significance in how they think about the event, or how others have passed on the knowledge to them. It may be likely that the SOIs that have helped build their knowledge of the flood have tended to focus on the impacts of the flood to give shock value to the risk message. Sources such as media (films, TV, documentaries) have acted as their primary source and they haven't been motivated to learn more.

Alternatively these informants are a group that do not find themselves talking about flooding often, so it may be that when discussing it emphasising the 'drama' helps add interest or significance to the topic

Box 4.3 Summary of list of categories identified for implications of the flood from informants' responses.

- Heightening of the dikes;
- Social changes;
- Point of socio-cultural/political change;
- Increased trust in authorities;
- Damages - human & physical.

(Extended version, with supporting excerpts available in Table B.7).

Implications ('resulted in') were the second most prominent semantic relationship described by New Wilhelmsburgers (Figure B.16) and the smallest semantic relationship described by Old Wilhelmsburgers (Figure B.19). New Wilhelmsburgers appear to have a more diverse awareness of or interest in the implications of the flood, as reflected by their comments about social changes and upheaval in the area - *"…A real turning point of the whole, of this place…some people left and the life this part of town… have never returned to it as it did. It never normalised into it's own way, business life, cultural life and whatever."* (P2). Its interesting that one New Wilhelmsburger suggests that it was how the authorities handled the flood (or specifically how Helmut Schmidt handled the flood) that lead to the trust residents have in the government regarding flood protection in Wilhelmsburg today (Table B.7).

All groups of informants talked about the damage that the flood caused to people and property in Wilhelmsburg (Table B.7). It is these damages associated with the flood that stand out in peoples' minds, and appear to mark the flood as historically significant:

- *"Around 300 people lost their lives…"* (P10, New Wilhelmsburger);
- *"…many people lost everything… they were traumatised"* (P14, Old Wilhelmsburger);
- "*Huge bunch of people killed*" (P12, Student);
- *"It was a huge catastrophe and many people died and many became homeless"* (P22, Immigrant).

One mature Student described how the flats in Kirchdorf Sued were built to house some of the people displaced by the floods in Reihersteig - "*…that the district was given up as a residential area and as a result Kirchdorf Sued was built.*" (P19).

The last prominent category identified in this theme, was that most informants commented on how the dikes had been raised in response to the 1962 flood (Table B.7). The only informant group that this was not readily evident in was amongst the Students (Table B.7, Figure B.17). However, given their awareness of the dikes it is likely that many of them do carry some awareness that it was the 62 flood that lead to them being heightened.

Causes for the 1962 Flood

In Figure 4.11 the 'resulted from' (yellow sphere) semantic relationship is next most prominent. That the dikes broke (and associated short-comings of the dikes back in 1962) and that the island was still recovering from the effects of the war came up the most as reasons why the flood occurred. Other points included: the lack of preparedness of the people, that they didn't see the danger and were taken by surprise. All the informant groups, except the Students, mentioned the dikes breaking as a cause for the 1962 flood (Table B.8, Figure B.17).

Box 4.4 lists the categories identified within this theme (causes of the flood), information on other aspects that resulted in the 1962 flood came mainly from New and Old Wilhelmsburgers (Table B.8). However, one mature student mentioned how those that had died, had been living in '*provisional, post-war housing*' (P19), implying that living in this housing had made these people vulnerable to the flood waters when they came. This poor level of housing was also mentioned by several New Wilhelmsburgers (Table B.8). Interestingly one Old Wilhelmsburger suggested that the social conditions of that time included the fact that people didn't feel they were at risk - *"… the perception wasn't as if you would be threatened here, the citizen said, 'high water comes and high water goes' "* (P8).

Box 4.4 Summary of list of categories identified for causes of the flood from informants' responses.

- Dikes breaking;
- Social conditions;
- Lack of warning;
- Lack of information & awareness;
- Heavy storm surge.

(Extended version, with supporting excerpts available Table B.8).

Not being prepared or aware of the risk was another category identified from informants' responses. That people didn't know that they were living with the risk of a flood - *"And a lot of people would live there but these were in flood danger. But they didn't know. I think people just didn't know."* (P1) and that they didn't have the information that residents have today as there wasn't the same "*media culture*" (P14). Connected to this was the lack of warning that people got the night of the flood, informants suggested that people were "*surprised and unprepared*" (P13), that the "*warnings didn't reach the district in time*" (P10) (Table B.8).

4.4.2 Reliance on public flood protection in Wilhelmsburg

Reliance on public flood protection looks at the degree to which informants place trust and confidence in external factors to provide protection from potential flood impact. These external factors can include reliance on city authorities, local NGOs or charity aid organisation and/or structural defences. The placing of trust and confidence in these external agents is here considered to be part of the outcomes of receipt and intake of the information that is available to them, therefore, an indication of how the risk and preparedness messages present are being interpreted by informants. Two themes were identified and explored, 'source/s of safety' and 'source/s of trust'. These themes looked at what or whom informants were indicating to be sources of safety for them (i.e. knowing they exist or were at work was indicated as bringing some degree of 'peace'), and in what or whom informants indicated they had faith in or trusted to protect them.

Sources of safety

Table 4.9 presents the findings from the 'source/s of safety' thematic analysis. Two main categories were identified within this theme: the dikes and the City. As would be expected in an island sustained by the protective barrier of dikes, these elements of structural defence represent a significant source of safety to informants. In fact all informants mentioned the dikes as being an important variable in terms of their sense of safety on the island. Two sub-categories were identified in regards to the dikes: the first involves the clear and visible presence of the dikes ('evident', Table 4.9) in everyday life in Wilhelmsburg: *"... I see dikes everywhere surrounding the district…"* (P22). The second sub-category relates to the knowledge informants have concerning structural parameters, and that since 1962 they have been raised significantly[31], and withstood larger storm surge events (in 1976) since then.

Table 4.9 Categories from 'source/s of safety' analysis.

Dikes		**The City**		
Evident	**Dikes have been raised**	**Prepared in case of a flood**	**People watch over the dikes**	**Last storm surge/s had no effect.**
• Dikes (P4) (P6) (P8) (P1) (P2) (P3) (P10) (P11) (P18) (P23) (P24); • *"...I think the dikes are safe… I am not afraid"* (P9) (P14); • *"Sure we are safe in Wilhelmsburg because our dikes are really*	• "*I know that the dikes were raised significantly, 2,3 metres they're higher. And it was in 76 there was a flooding and in 78 as well and but it didn't…quite high water level. But it didn't flow over, just till the top*." (P4); • "*The Wilhelmsburger still live with it, but became calmer. The dikes were raised*." (P5); • "*The dikes have a certain height…so that the high water can't go over it*" (P8);	• "*For 1962 there was no information and no media culture like we have now. So it would no problem to get informed if there's some risk or anything*." (P14); • "*The only part of Germany we have filled sand bags here nearly in Wilhelmsburg 80,000 sand sacks and the only part of Germany where we have filled one*." (P20); • "*Hamburg is*	• "*We* [the Deichwacht] *are here... if there is high water and it seems that the dike will become wet or something that we and other aid organisations… start to save the dikes with sandbags*." (P8); • "*They take good care of them* [dikes]" (P14);	• "*Dikes raised higher then 76 & 78*" (P4), • "*Calm with the improvements made to the dikes*" (P5); • "*The last great flood was in 1976 or 78. It was 7 metre something high, but the dikes were already 8 meter high,*

[31] Raised from a level of 5.20 m to between 8.00 and 9.30m (von Storch, 2008)

Dikes		**The City**		
Evident	**Dikes have been raised**	**Prepared in case of a flood**	**People watch over the dikes**	**Last storm surge/s had no effect.**
good" (P20) (P25); • *"... I see dikes everywhere surrounding the district…"* (P22); • *"Protection seems very good now, I mean there are dikes everywhere"* (P12).	• "*For normal water, the dikes are high enough…we don't have to worry*" (P9); • "*I feel safe, the dikes are high enough*"(P14); • "*They* [the dikes] *were raised in the course of time and we aren't afraid*" (P25); • "*As far as I know, the dikes are quite highly built right now. As far as I know it's quite unlikely that anything happens*" (P27).	*well prepared, I see dikes everywhere surrounding the district…*" (P22); • "*Well I have had a little look in the museum here on the Elbinsel, which explains what people did after that in order to prevent floods from happening*" (P1); • "*They really made sure there is a huge, well-thought-through system of dikes and made it higher*" (P3); • "*Technicology and money will solve it*" (P23).	• "*We have good personal that look for the dikes...*" (P20).	*this is why it didn't cause trouble*" (P18); • "*And there was a flood in 1976, too. It was higher than in 1962... It was very much higher, but in the meantime they were more prepared for it*." (P13).

'The City' is the second category identified in this theme, by this the analysis refers to the city authorities in charge of preparing Hamburg (and Wilhelmsburg) in case of an emergency and those authorities in charge of developing and maintaining the dikes and structural 'preventative' flood defence measures (Table 4.9). Most informants knew that a flood information pamphlet was sent out each year detailing evacuation and emergency procedures in case of a flood, but very few had read this or knew what city authorities had done to protect and prepare Wilhelmsburg (beyond the dikes) (Table 4.4, Figure 4.7). Despite this lack of knowledge, informants did indicate that 'the City' was a source of safety for them. Sub-categories included finding security in:

- The City being 'prepared in case of a flood' "*The only part of Germany we have filled sand bags here nearly in Wilhelmsburg 80,000 sand sacks and the only part of Germany where we have filled one*." (P20);
- The City 'watching over the dikes' *"…they take good care of them* [dikes]" (P14); and lastly that because of actions taken by 'the City'

- ‘The last storm surge/s had no effect’ “[we are] *calm with the improvements made to the dikes*” (P5).

Sources of trust

Table 4.10 presents the findings from the identification of categories in which informants demonstrated some degree of trust concerning their protection from the impacts of flooding. Like the analysis of ‘source/s of safety’ the two main categories identified were the ‘dikes’ and ‘the City’ (Table 4.10). Informants showed trust in two sub-categories relating to the dikes:

- That they can continue to be adapted (raised) to protect future floods "*And I think the Hamburg government is going in next year to make a ...we are going 80cm higher*." (P20), and
- That the dikes are built well *“… trust that the dikes keep up, they* [the dikes] *were raised in the course of time and we aren’t afraid*” (P25).

Sub-categories related to ‘the City’, involve trust that:

- ‘The City’ have prepared for a potential flood in Wilhelmsburg;
- ‘The City’ is responsible for the looking after the dikes and that they are doing a good job;
- ‘The City’ will inform and are informing residents of Wilhelmsburg about the flood risk and what to do if there is a flood; and
- ‘The City’ has the technology to protect them.

Table 4.10 Categories from 'source/s of trust' analysis.

Dikes		The City			
Being adapted to sea level rise	**Being well built & holding up**	**Having prepared**	**Being responsible**	**Informing**	**Technology**
• "*According to the calculation of the engineers*" (P8); • "*And I think the Hamburg government is going in next year to make a …we are going 80cm higher*." (P20).	• "*Trust that the dikes keep up, they [the dikes] were raised in the course of time and we aren't afraid*" (P25).	• "*The Deichwacht is watching over the integrity of the dikes during storms*" (P8); • "*The only part of Germany we have filled sand bags here nearly in Wilhelmsburg 80,000 sand sacks and the only part of Germany where we have filled one*." (P20); • "*Hamburg is well prepared…*" (P22); • "*They really made sure there is a huge, well-thought through system of dikes*" (P3), • "*They were more prepared for it* [76 storm surge]" (P13); • "*I really hope they got it under control…I think they really modernised everything… I mean they got lots of regulating stuff… I think there has been some good thinking*" (P12).	• "*They* [the Behoerde] *take really good care of them* [dikes]" (P14); • "*Good personnel looking after the dikes*" (P20); • "*I trust … and the people responsible are doing their job right*" (P2).	• "*For 1962 there was no information and no media culture like we have now. So it would no problem to get informed if there's some risk or anything*." (P14); • "*Population is regularly informed by the city*" (P22).	• "*I trust their technology*"(P2); • "*There has to be development with the dikes, but its manageable, technology and money will solve it*" (P23).

4.5 Cognitive Appraisal Processes

4.5.1 Threat Appraisal

Analysis of the concept of threat appraisal looked at:

- The 'perception of flooding as a threat' (inclusive of emotion/fear); and
- The 'perceived need to prepare'.

Perception of flooding as a threat

Figure 4.12 shows the response categories for informants' responses regarding their perceptions of flooding as a threat to Wilhelmsburg. Three response categories were identified: 'No [threat]'; 'Yes [there is a threat]'; and 'Unsure'. Two informants gave no response or indication of threat perception and are indicated as 'no response' in Figure 4.12.

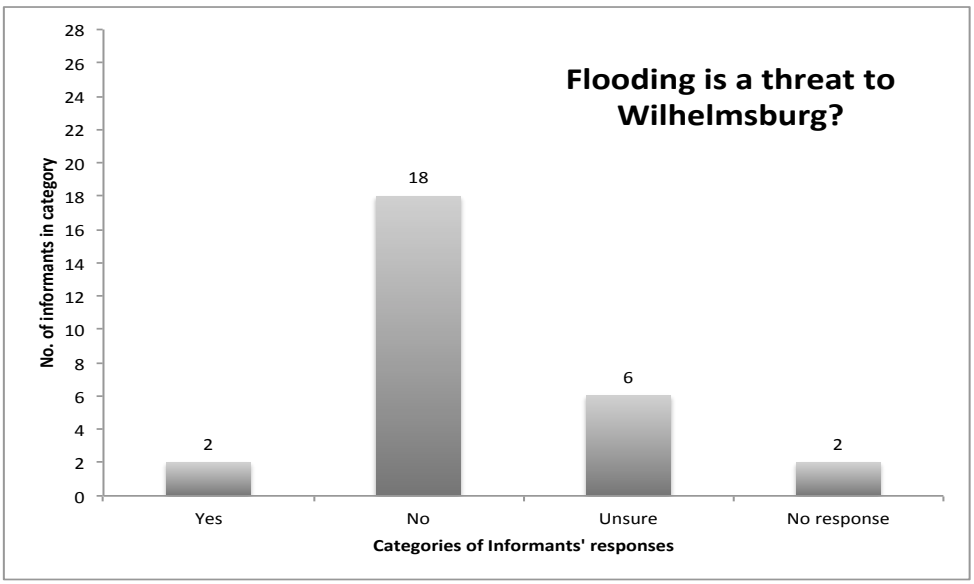


Figure 4.12 Categories of responses regarding informants' perception of flooding as a threat to Wilhelmsburg. Category descriptions: 'Yes' indicates those that stated that they did think flooding was a threat, and 'No' the opposite, 'Unsure' informants were those that did not have a clear opinion on the matter (N=26).

Only two informants did see flooding as a threat (Figure 4.12) and both were Old Wilhelmsburgers, one who experienced the 1962 flood and the other a local tour operator, whose tours include discussions about the events of 1962. This latter informant saw the threat as being largely underestimated by everyone - including the city authorities. This informant believed that the low perception of risk within current attitudes to flooding of Wilhelmsburg residents, and the

growing complacency [he perceived] within city authorities, reflected the situation prior to the 1962 flood.

Two informants from immigrant backgrounds, two students, an informant who works on the island but doesn't live there, and one informant new to the island, all indicted a sense of uncertainty in regards to seeing flooding as a threat to Wilhelmsburg (Figure 4.12). These informants perceived the possibility that flooding could be a threat (Figure 4.14), but demonstrated some lack of certainty in their response, often stating their inability to adequately assess the situation.

Most informants do not see flooding as a threat (Figure 4.12), and consider it to have a very low probability of happening "*I think since the safety measures are in such a scale, there is no longer the threat or the possibility that I could think of, and therefore, I don't need to worry about it.*" (P2). Informants gave two main reasons as to why flooding was not a threat, these were: the dikes are perceived as effective protection against floods (linking back to their reliance on public protection); and within current thinking flooding is not a threat 'at the moment', but in the future and with climate change might become one (Figure 4.14).

To deepen the exploration of informants' risk perception, some informants were asked during interviews whether they worry about flooding, or feel safe on the island (in general) (Figure 4.13). These questions were aimed at exploring informants fear and emotions related to flooding. Emotions have been recorded as playing an important role on the creation of risk perceptions (Slovic, 2010). Indeed, fear is a central element of PMT (Rodgers, 1975). In general most informants indicated that they did not worry about flooding in Wilhelmsburg, and almost all informants said that they felt safe on the island (Figure 4.13), although many female informants did say that they took care at night, and did not like the Turkish men gathered on the street corners smoking. Flooding only really held emotional significance to those informants who experienced the 1962 flood. This lack of emotional connection with flooding represents another way that residents are disconnected with the river and its potential risks. The

same Old Wilhelmsburger who had felt that the flood threat was underestimated, was also the only informant to indicate that they did not feel safe on the island (Figure 4.13). No immigrants indicated that they worried about flooding, however, of those that did three were Old Wilhelmsburgers, two were New Wilhelmsburgers, and two were Students.

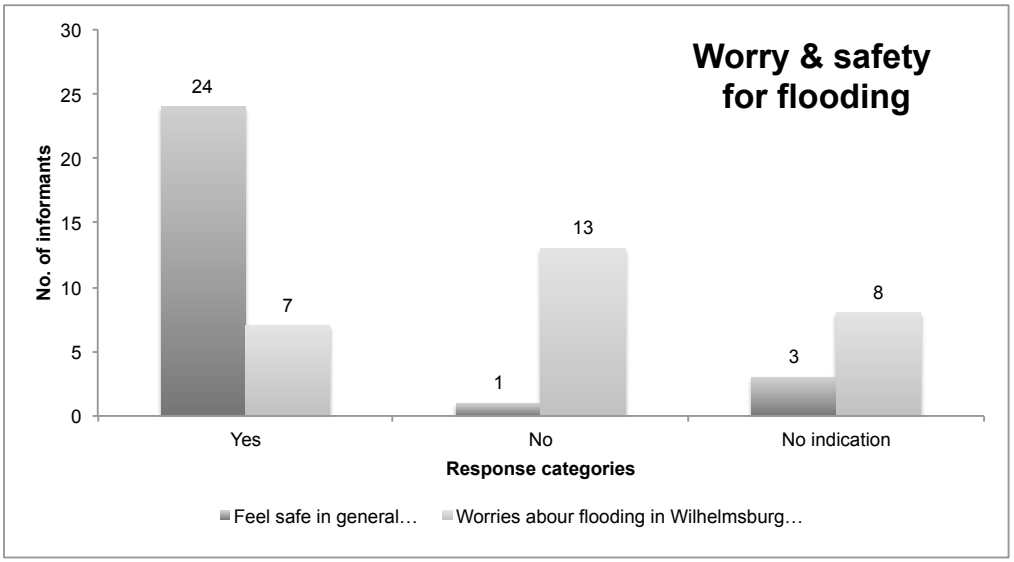


Figure 4.13 Informants' response categories for the questions: do you worry about flooding living in Wilhelmsburg (N=26); and do you feel safe [in general] living in Wilhelmsburg (N=22). 'Yes' indicates a positive response, i.e. they do feel safe or they do worry about flooding; 'No' indicates a negative response; and 'No indication' includes those to whom the question wasn't asked.

Three themes emerged from the exploration of informants' flood risk perceptions. These three themes are:

1. '*Source of safety*', those aspect used by informants to ground them in a sense of safety and comfort while living on the island;
2. '*Sources of concern*' information and awareness that informants have that reminds them that there is a risk to living on an island; and
3. '*Uncertainty*' essentially the factor between the other two variables, that has the potential to shift confidence in one or the other relative to how uncertain the informant feels about either.

Figure 4.14 presents a diagram of the relationship between these three themes and the categories identified within them. In addition, the influence of other concepts discussed in previous sections has also been included in Figure 4.14.

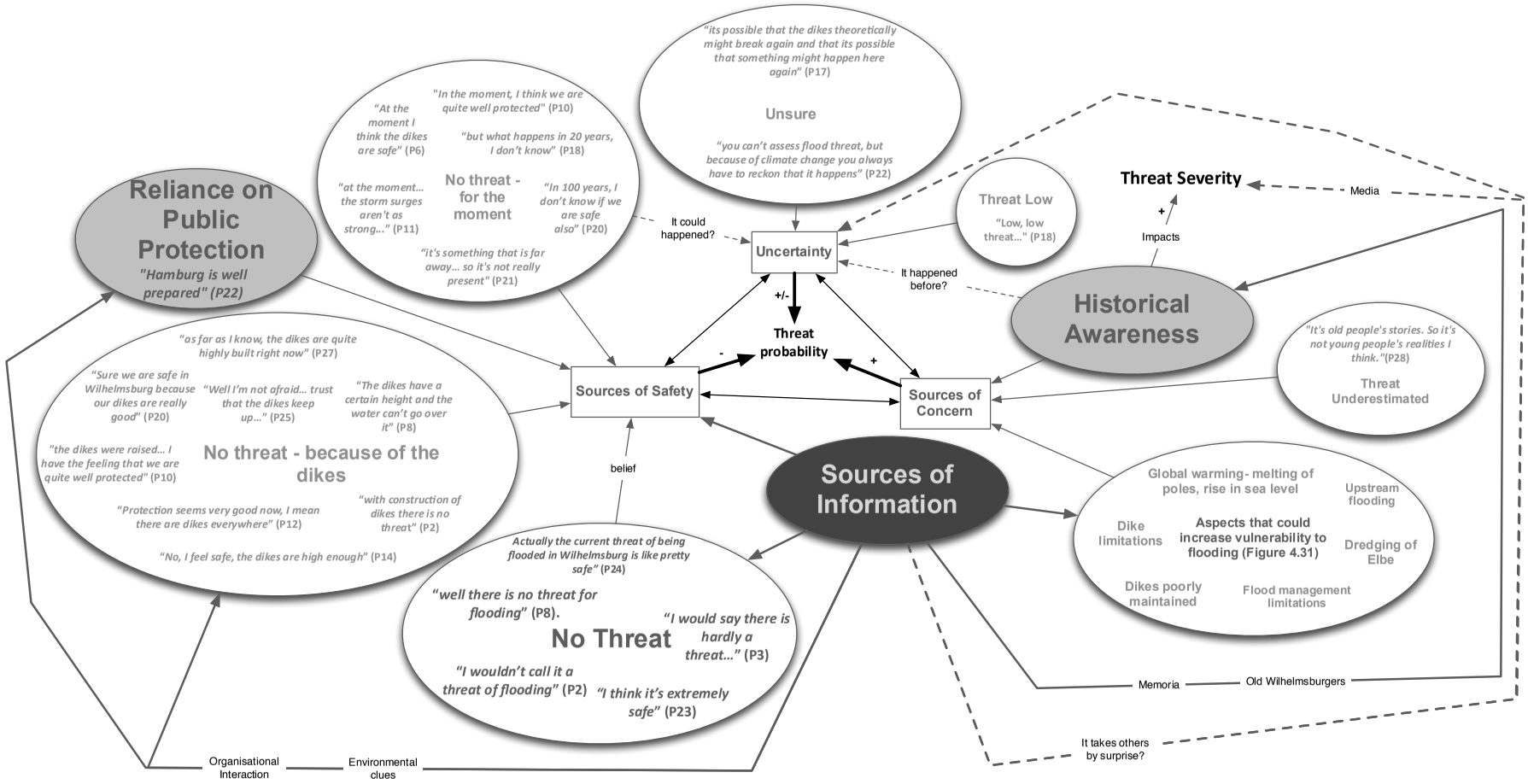


Figure 4.14 The three aspects identified as influencing informants' perception of the threat, its probability and severity. Solid lines represent identified links; dashed links represents assumed (by the author) links.

These themes are related to how informants' perceive their vulnerability to the threat. This for the most part is dominated by their perception of the probability of there being a risk of flooding, however, as can be seen from their coping strategies discussed in Section 4.6, there is an element of their assessment of personal exposure (i.e. living on the ground floor or low-lying areas) as well. No real evidence of assessment of threat severity was identifiable in informants' responses, however, as discussed in a previous section (4.4), a prominent semantic relationship identified in how informants think of the flood history of the island is tied to the impacts (Figure 4.11) of the flood and as such their historical awareness gives them a point of reference for threat severity. In addition to this, media messages reporting on flood disasters elsewhere in the world also provide reference for informants' perception of possible severity of a flood should it occur in Wilhelmsburg.

Sources of safety, uncertainty and sources of concern

As discussed in the previous section, the dikes and the city represent sources of safety in which informants have come to trust and rely on to keep them safe from floods. As such they represent categories within the theme 'sources of safety'. Given that informants provide these as a reason for not believing that flooding is a threat, it can be established that sources of safety diminish informants' perception of risk and vulnerability. The other reason given by informants for not seeing flooding as a threat, involved the 'no threat – for the moment' point of view. This perspective is an interesting one, because it involves a strange mix of:

- Active awareness and knowledge concerning climate change the issues facing Hamburg into the future;
- A need to minimise any discomfort created from awareness of the flood history of the island;
- Acts as an 'easy' excuse not to have to worry or be overly concerned with preparing for potential flood events; and
- Acts as a coping strategy to relieve and shift concern the associated uncertainty creates.

Unfortunately climate change messages contain strong elements of uncertainty around what might happen in the future (Figure 4.14). This uncertainty can act in influencing changes in both sources of safety and sources of concern. Within Wilhelmsburg this ultimately meant creating the situation where climate change and future flood risk were seen as both a source of safety and a source of concern.

The uncertainty around climate change messages creates room for postponement of the need to be currently 'inconvenienced' or concerned about the issue. When the issue is then aligned with flood risk and impact, the outcome is that those at risk postpone the need to see flooding as an imminent threat that needs to be prepared for now. This postponement is on the one side a psychological coping mechanism, and on the other a justification not to have to extend oneself, physically or financially. Ultimately it establishes a situation where risk messages around climate change and future flood risk have the effect of a source of safety on vulnerable communities, and reduces the perception of there being a threat.

Alternatively, the uncertainty around climate change does also act as a source of concern, and influences the strength of other source of concern. Informants who considered there to be no threat of flooding, did see situations that might increase their vulnerability to flooding as 'sources of concern' (Figure 4.14). Figure 4.15 presents the different things informant indicated as perceiving as active threats.

Climate change impacts were a significant concern among informants (Figure 4.15), especially as it may affect them through the melting of poles and estimations in sea-level rises, which both are projected to increase flood risk to the island. In many ways this could be considered to be a good indication of how affective climate change awareness initiatives in Germany have been. It appears that fears related to what may happen in the future in regards to global warming are real to the informants, and creates some discomfort and stress.

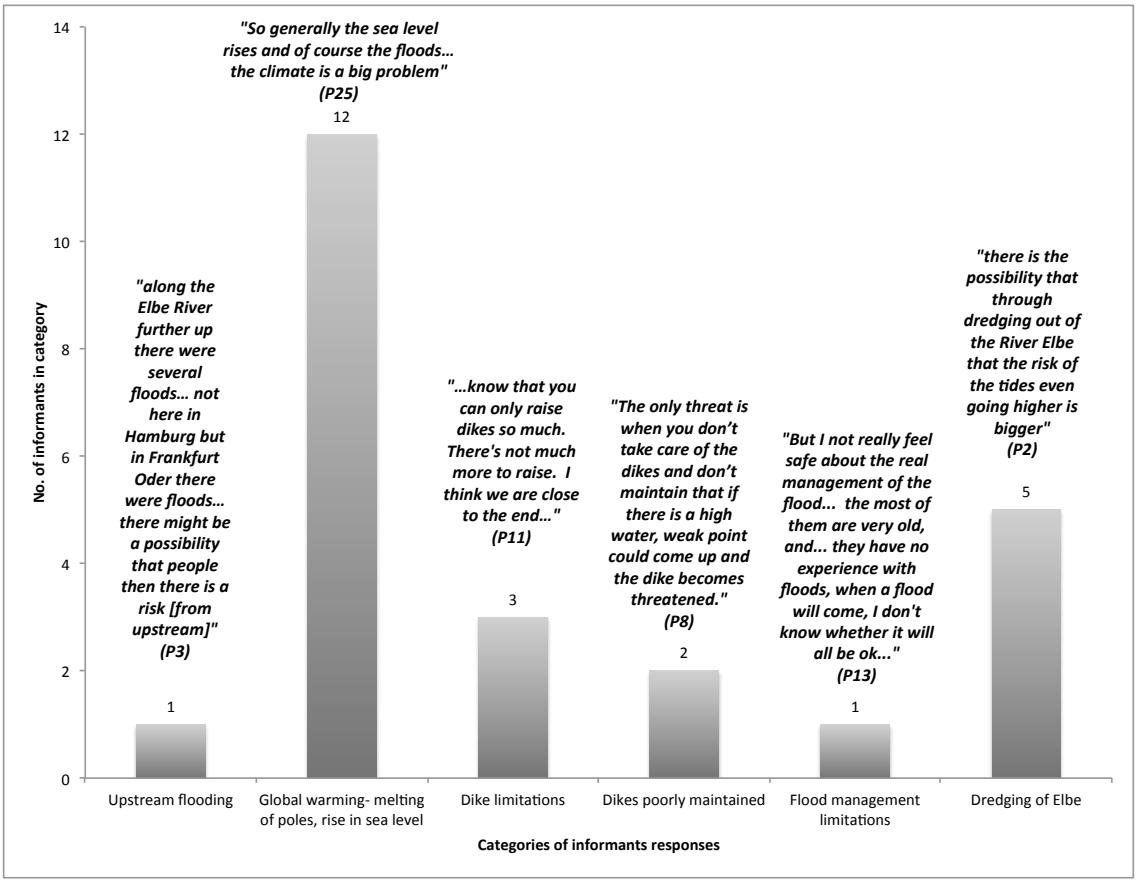


Figure 4.15 The categories of threats perceived by informants as posing a risk to Wilhelmsburg are shown. The number of informants whose responses fell within each category are indicated by the columns - note that some informants shared multiple views and therefore, fell within multiple categories.

Another aspect of life in Hamburg, that causes informants discomfort is the dredging and narrowing of the Elbe (Figure 4.15). This is principally done to increase the effectiveness of the harbour and the movement of large cargo vessels in it, but is also a consequence of public flood protection developments (von Storch et al., 2006). These developments have affectively limited the capacity of the river to spread into its natural flood plain. Dredging of the river carries significant levels of concern for the informants, specifically Old Wilhelmsburgers who have lived on the island for over 20 years and have seen the river changed.

As to be expected the dikes also represented an aspect of life in Wilhelmsburg that carry a level of perceived threat (Figure 4.15). In this research two main sub-categories were identified, these are: poor maintenance of the dikes, and limitations to the protective ability or height of the dikes. Historical awareness of

the causes of the 1962 flood attribute the failure of the dikes to their poor condition and care. Several informants indicated that issues relating to the maintenance of the dikes were a point of concern and threat to Wilhelmsburg (Figure 4.15). In addition, some informants identified that the dikes did have limitations, these are connected to:

- The dikes structural integrity "*it is possible that the dikes theoretically might break again and that it's possible that something might happen here again…*" (P17); and
- The limitation in structural design "*I know that you can only raise the dikes so much. There is not much more to raise. I think we are close to the end…*" (P11).

Informants' perceived need to prepare.

In the light of these sources of concern (Figure 4.14 & 4.15), and the uncertainty they create within informants' risk perception, the second perspective of 'perceived need to prepare' was explored. This provides:

- Some indication of informants' opinions/beliefs in regards to needing to prepare.
- Indication of the degree to which their threat appraisal is leading to coping appraisal if not protective responses.

Figure 4.16 illustrates that amongst those that did have responses that reflected their perception on the need to [personally] prepare for flooding in Wilhelmsburg (N=12), the largest proportion indicated that there is a need to be preparing. Interestingly, however, they all followed their comments with the honest testimony that they had never fulfilled their intentions to prepare. Box 4.5 lists some of these responses.

Of the 28 informants interviewed for this study only one had actually organised an emergency plan with his wife, and had stores and emergency supplies available in his house in case of an event: "*Actually that is agreed upon and my wife knows it and I have my first aid box at home, I have the emergency supplies, I have a torch, candles that's important if the light is off. Actually that's sufficient, what else should we do*?" (P8). This informant who is involved with

the local Deichwacht, also suggested that knowledge on how to prepare for a flood in Wilhelmsburg is part of the culture amongst Old Wilhelmsburgers: "*…expect that everyone informs themselves for a start. With a brochure or something else, to protect themselves…you have to have at least for 5 days supplies in you flat so you can provide yourself…The old Wilhelmsburger they know it. They always have something for 2, 3 days at home*" (P8) - this was not something this study found to be true.

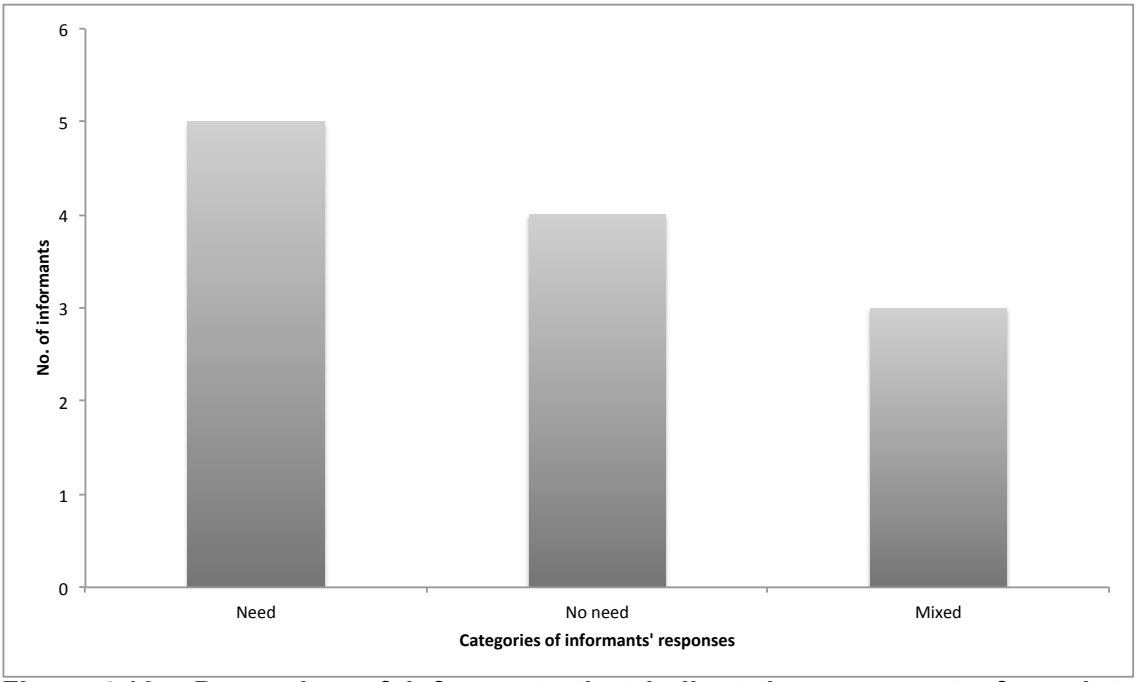


Figure 4.16 Proportion of informants that indicated assessment of need to prepare during their interviews (N=12). Category 'Need' indicates those that indicated that they did believe there is a need to have flood preparedness measures in place; 'No need' indicates those that indicated that there was no perceived need to prepare; 'mixed' includes those that indicated divergent opinions or uncertainty in their beliefs by suggesting both a need and a lack of need to prepare.

Box 4.5 Informants' testimonies regarding their following through with their perceived need to prepare.

- "*I always wanted an emergency capsule but didn't do it. Like an inflatable boat. But I don't have it*." (P11);
- "*I should do something, but I didn't*" (P13);
- "*I'm planning this for ten years but still haven't done it. I always wanted to get a box. Like an emergency box, where everything...well I'm just not the safety kind of person*" (P19).

There were also a proportion of informants who openly saw no need to prepare for floods; their responses are listed in Box 4.6.

Box 4.6 Informants' responses that indicated a perceived lack of need to prepare for flooding in Wilhelmsburg.

- "[Do you consider yourself prepared] *No, because I said, because I said in the beginning I don't see the threat*" (P3);
- "[Does your business or do you have an emergency plan?] *What for? No. Why?*" (P18);
- "*I don't feel threatened. So nobody has to take precautions to make me safe. What against*?" (P24);
- "*Nope* [consider self prepared], *but I don't mind. If something happens then it happens, but no… Well for me it's very far away. It might be again but I don't occupy myself with that* (P27).

Some informants showed a mixture of responses, indicating both a perceived need for Wilhelmsburg to prepare, but a lack of need for themselves to prepare (Figure 4.17). For some location played a big part in their perceptions, they lived on higher floors and felt that that constituted efficient protection from any potential floods:

- "*If I live on the 5th floor I don't need to leave. Till the 5th floor the water will never go. Just what's on the ground floor, 2 to 3 metre*" (P8);
- "*I live in 5th floor. It's easy than when you live on the ground*" (P13).

One mixed response suggested that exposure to media around the 50-year memorial for the 1962 flood had broadened her awareness of what is needed to survive a flood: "*Yes. Something that I didn't know. There's a lot of talking about the history of the flood because of the 50th anniversary next year. And what I didn't know was that the main problem for the people who stayed here, was to have clear water afterwards. So maybe I would think about that…I wouldn't have thought about that before. So before I would just have turned on TV and waited until something is happening. I wouldn't even have cared about water…*" (P24). However, this was not sufficient to shift her perceptions on her own need to prepare: "*I don't feel threatened. So nobody has to take precautions to make me safe. What against?*" (P24).

4.5.2 Coping Appraisal

It was expected, given informants lack of flood experience, that prior to the interviews informants had undertaken very little coping appraisal. In order to try to elicit some form of coping appraisal by informants, they were taken through a scenario during interviews that described the situation in which a significant storm surge is heading towards Hamburg, and the city believes that the risk of

the dikes being breached and Wilhelmsburg flooded is very high (visual tools were used to help make the scenario more real to informants). Based on this informants were asked about how they thought they would respond, how they saw their community responding, what would be their first priority and who they thought they could most rely on. Figure 4.17 presents the themes and categories, around which informants' are believed to determine the need to think about coping with possible future floods.

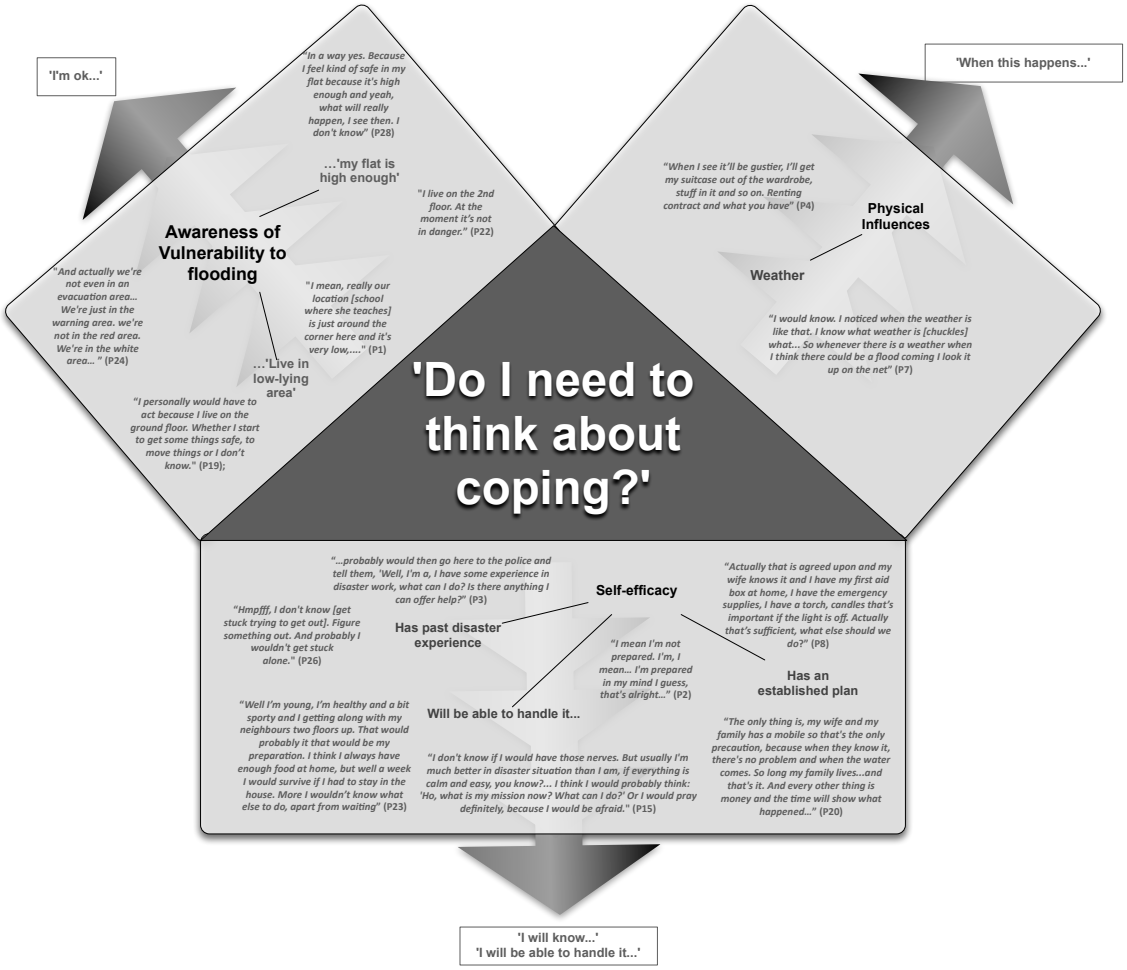


Figure 4.17 Themes and categories around which informants' determine the need to think about coping with possible future floods (coping appraisal).

The three themes that were identified from informants' responses are (Figure 4.17):

- 'Awareness of vulnerability to flooding';
- 'Physical influences'; and
- 'Self-efficacy'.

Although, informants were identified as using this information to help them determine their coping responses and ability, all of the identified themes have the effect of substantiating for the informant why they do not need to think about coping at present.

'Awareness of personal vulnerability' involved two categories: 'my flat is high enough' and 'I live in a low-lying area' (Figure 4.17). These categories involved informants' awareness of areas in Wilhelmsburg that are most at risk and that their flat was located either above or below the perceived flood level. In respect to their location informants believed that they would be safe. Only one informant said that their choice of flat was influenced by the consideration of flood risk. So even though they are aware of location as a point of safety, they are not considering flood risk in their consideration of where they choose to live in general. This theme appeared to have the effect of assuring informants that they would be 'ok' and didn't really need to worry any further about thinking about coping options. In many respects this theme appears to have an over-lapping nature, on the one hand it plays the role of an additional threat probability and severity appraisal, on the other hand it has the effect of acting as a non-protective response that reduces the concern informants' may have. However, relative to the analysis and interpretation done here (by the author), informants were found to use this theme to assess whether they need to think about coping or not.

The theme 'self-efficacy' involves the confidence informants had in their own abilities to adapt and or cope. It included three categories (Figure 4.17):

- 'Has past disaster experience';
- 'Will be able to handle it'; and
- 'Has an established plan'

The category 'will be able to handle it', involved aspects of:

- Belief in not being alone;
- Belief that given enough warning they could prepare affectively';
- Belief in own abilities to get by; and

- Knowledge that during times of stress they tend be able to keep a level head.

Based on this appraisal of personal abilities, this category enabled informants to believe that they would be able to handle a flood should it occur, and assured them that they didn't need to think further about coping options. As mentioned in the previous section, only one informant described having an emergency plan in place, however, having this plan pre-organised contributed to his sense of self-efficacy. Past disaster experience with earthquakes in Turkey also was used by an informant to gauge what he would do during a flood - *"…probably would then go here to the police and tell them, 'Well, I'm a, I have some experience in disaster work, what can I do? Is there anything I can offer help?*" (P3). Being in a position of believing he could provide help or assistance because of his experience has the additional value of adding to his sense of self-efficacy.

Physical influences (Figure 4.17), involved things that told informants when they would need to act, and included awareness of environmental (weather) signs of storms and high potentials for flooding. These were employed mainly by those informants who had experienced the 1962 flood or had maritime experience. These signs gave informants clue to pending danger and indications of when to prepare - "*When I see it'll be gustier, I'll get my suitcase out of the wardrobe, stuff in it and so on. Renting contract and what you have*" (P4). Although, here described under its own theme and relative to the link with weather as opposed to informant's own ability, these responses contribute to informants' self-efficacy in that they form part of their perceived capacity to judge the signs and respond accordingly.

These themes collectively indicate a high level of confidence amongst informants that should a flood take place, they would be able to act and survive. However, having these perceptions of their own abilities to cope, to help or to understand the signs, alleviate any discomfort caused by sources of concern or uncertainty and limit actual contemplation of preparedness behaviour (Figure 4.17).

Informants' perceptions of personal preparedness

To explore this confidence further, some informants (based on how interviews were progressing) were asked about whether they considered themselves prepared for a flood. Figure 4.18 presents the response categories for this inquiry, as can be seen of those informants who were asked this question (N=17) the largest proportion (8) indicated that they did indeed feel they were prepared for a flood. The second largest proportion (6) indicated the opposite and felt that they were not prepared. Three informants held mixed views, most indicating that in respect to certain aspects they felt prepared, but for others they did not.

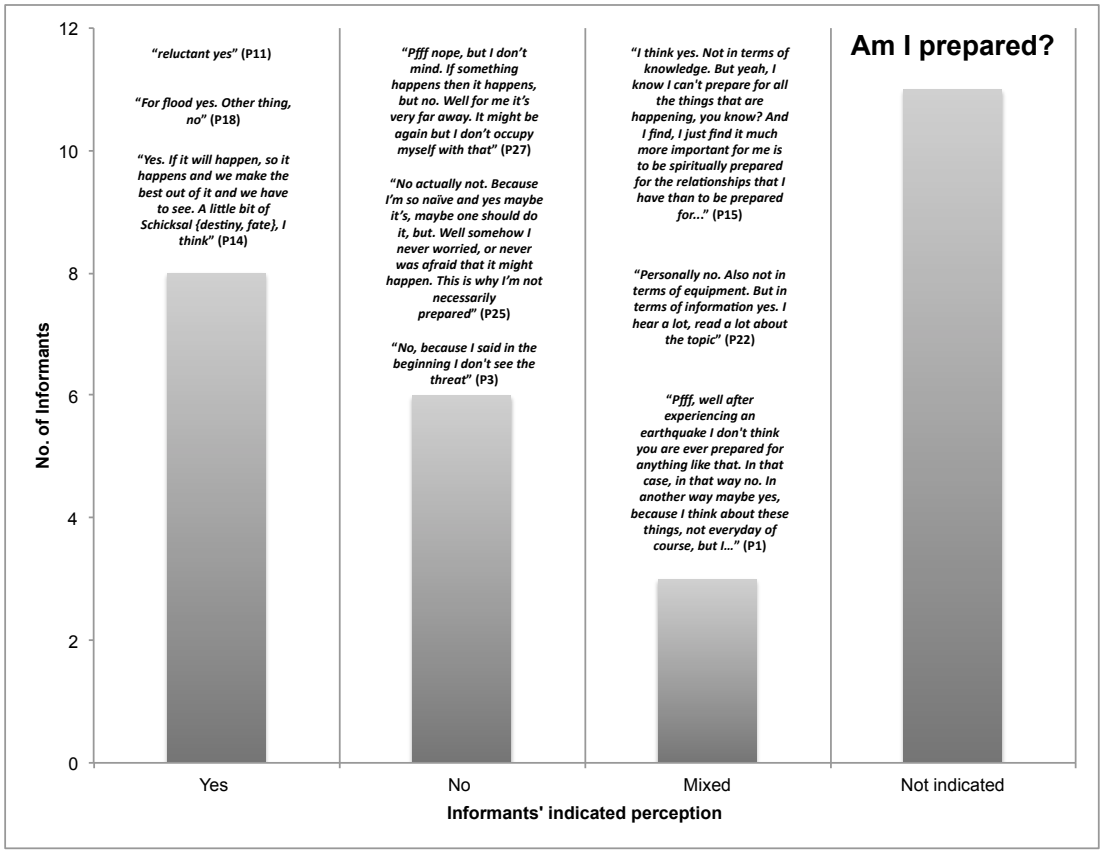


Figure 4.18 Categories of perceptions of informants on whether they 'feel prepared for a flood' - responses include both personal ('I') or community ('we') perspectives on sense of flood preparedness (segments represent number of informants that shared a perception or carried a similar one, N=17).

For those who indicated that they did feel prepared, location was again a factor "*I'm living on the fourth floor…*" (P2). Confidence in own ability to get information and know what to do in the event of a flood also featured, as did the undercurrents of faith in public flood protection "*actually I think we are quite well*

prepared" (P12). Lack of perceived threat was cited as the prime reason informants didn't feel they were prepared:

- "*…I don't see the threat*" (P3);
- "*I never worried, or never was afraid that it might happen…*" (P25);
- "*…well for me it's very far away…*" (P27).

Given the strategies informants employ to assess the need to think about coping (Figure 4.17), it is not really surprising that of the informants asked the majority had a sense of being prepared, or at least a sense of being prepared in some areas if not others. However, a perception of being prepared already is likely to have the effect of providing feedback to the threat appraisal process that reduces it.

Informants' knowledge of preparedness options

What assessment of preparedness options informants had undertaken made up the last aspect of looking at coping appraisal amongst informants. Its not surprising that the work that Prof Pasche and his team from the TUHH did with some residents concerning flood preparedness came up during interviews "*He* [Prof. Pasche] *always made the course… he always named the errors that you always make again. The, for example, the whole connections in a house. If you have a house you need the following: You need water, gas for the heating and electricity and that you put in the basement and when the water comes, Pasche held a presentation, it has to go in the attic*" (P6). The TUHH's workshops had the effect of making informants' sources of concerns about their belongings and property more prominent, and providing strategies for protecting them. However, as discussed in Section 4.3 (organizational interactions) informants showed concern over the fact that although Prof Pasche had given them this information, the City did not appear to be utilizing it in their own developments and redevelopments. As the costs associated with structural mitigation measures to their own homes is high, cost was listed as a reason why preparedness strategies relating to protecting homes from flood damage is not feasible. Box 4.7 lists some quotes from informants regarding cost issues. One informant suggested that the cost just did not match the likelihood or

uncertainty - "*Well money for sure is a reason that you don't do it to… You never know if it's necessary"* (P9).

Box 4.7 Informants' quotes regarding costs related to preparedness

- "*But we can protect it* [their house] *if we do something in the basement and in front of the front door. This is around 1,000 Euro it would cost at the moment*." (P6);
- "*Well money for sure is a reason that you don't do it to, what do I know, protect windows with inflatable bags. It all is expensive, so if you want to seal the house. Seal doors. It all is expensive and this keeps many and us as well from doing anything. You never know if it's necessary*" (P9).
- "*Difficult. That is force majeur. You can't insure against it. That's not possible. You can just have governmental programs to help one. The English Lloyd, they have insurance. My husband heard that from a friend. But this is so high the annual fees. The fees are around 2,000 Euro annually. That's nonsense*" (P10).

Flood insurance is not available to residents on Wilhelmsburg, but it does represent a preparedness strategy that requires little effort on the part of the person to utilize in ensuring they can at least recover from a flood if it did occur. Analysis of informants' knowledge of preparedness options, therefore, included exploring if informants had looked into flood insurance as an option, or knew that flood insurance wasn't available to them. Figure 4.19 presents the categories of responses informants' gave concerning flood insurance in Wilhelmsburg.

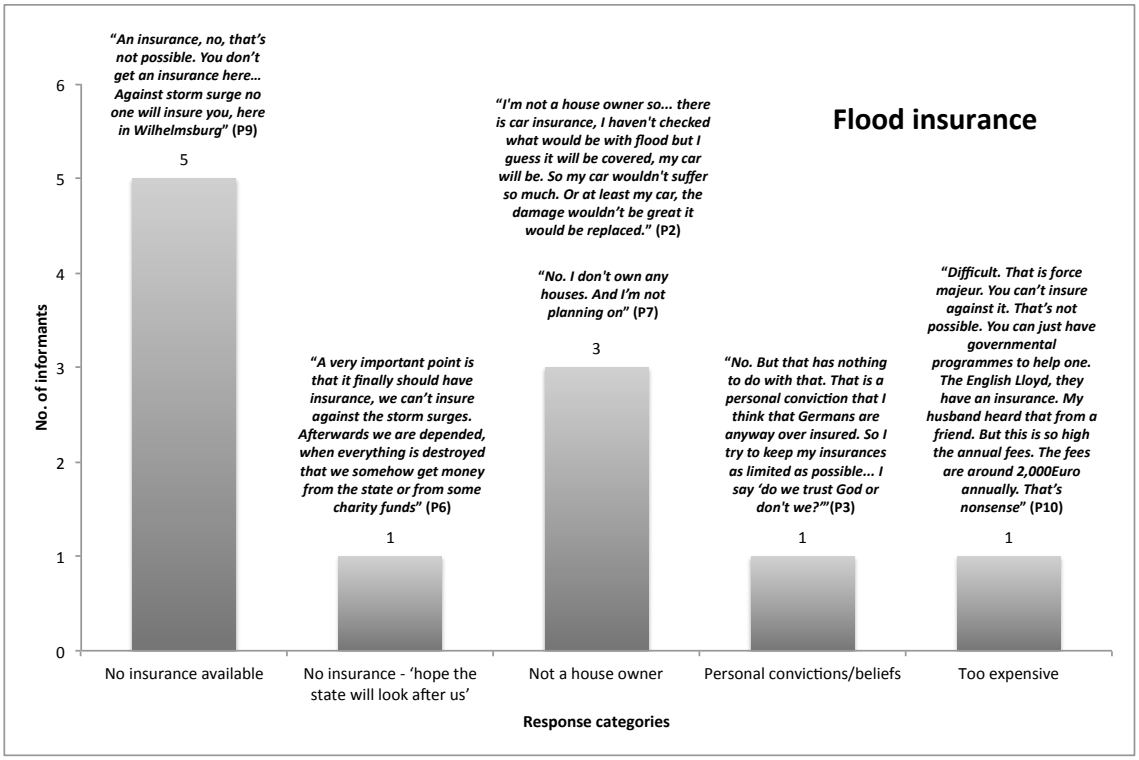


Figure 4.19 Informants' views and knowledge about flood insurance in Wilhelmsburg.

For the most part informants are well aware that flood insurance is not available to them. Many indicated that because they were not homeowners, it was not something that concerned them. One informant discussed how her husband had looked into flood insurance on the island, but found that the only option was too expensive to be feasible (Figure 4.19). Another informant suggested that his lack of looking into flood insurance options involved his spiritual beliefs and personal convictions.

4.6 Coping responses

Although informants do not perceive flooding as a threat, most have some awareness of the 1962 event, through local environment clues, from media or discussions with those who lived through the flood. This awareness makes it difficult for informants to truly be in denial of the potential for another flood. In addition, although flooding itself may not be recognised as a threat, those things that potentially increases their vulnerability to flooding are seen as points of concern (Figure 4.14). This has the effect of generating an undercurrent of concern or stress that will need some sort of coping response to reduce (fear). However, this exploration has found there is little to no actual protective responses being undertaken by informants. What this suggests is that for the most part the mechanisms utilised to reduce their stress are non-protective (Table 4.11). Indeed the way that informants used different aspects to assess the need to think about coping, and that these all resulted in a diminished sense of need (Figure 4.17) also suggests that informants are employing non-protective responses to deal with any forms of stress, concern or fear that they have regarding future floods. Three different forms of non-protective coping strategies were identified in this study: cognitive, emotive and situational strategies (Table 4.11).

Table 4.11 Non-protective responses or through patterns evident in informants' responses.

Strategies		Old Wilhelmsburgers	New Wilhelmsburgers
Cognitive strategies	Do not think about it		• "*I don't know when was the last time I was thinking about it?"* (P17); • "*I wouldn't say that its a topic that I'm really so interested in*" (P21).
	Postponement of problem	• "*At the moment…*" (P6) (P8); • "*Currently…*" (P9); • "*In 100 years…*" (P20).	• "*In the moment, I think we are quite well protected*" (P10); • "*At the moment…*" (P11); • "*But what happens in 20 years, I don't know*" (P18); • "*But it's something that is far away, somehow, so it's not really present…*" (P21).
Emotive (affective) strategies	Sense of safety	• "*I think we don't really bother, we don't live in a constant state of fear*" (P9); • "*I'm sure we are on a good way and I'm not afraid at all that Wilhelmsburg have a problem*" (P20);	• "*I think we're safe here*" (P2); • "*I never felt really threatened*" (P3); • "*I have the feeling that we are quite well protected*" (P10); • "*Nobody really worries about flooding, because everybody feels protected*" (P12).
Situation strategies	Location	• "*I live on the 5th floor I don't need to leave. Till the 5th floor the water will never go. Just what's on the ground floor, 2 to 3 metre*" (P8); • "*So we could go upstairs…*" (P14)	• "*I'm living on the 4th floor so the question is where should I park my car*" (P2); • "*The second floor, I think I'm gonna make it*" (P12).
	Friends & family	• "*So we could go… or anywhere to friends*." (P14); • "*Also my girl friends and my neighbours and all the other people I know, they trust that the dikes keep up*" (P25).	• "*I got a friend who lives in the fourth floor of a house... I just could give him a knock*." (P12)

Amongst cognitive strategies, the two strategies that were identified from informants' responses were: 'do not think about it' and 'postponement of the problem'. Within these two processes informants reduce their discomfort connected to the potential risk of flooding, by simply reducing the importance of the issue and largely ignoring the topic in their general thinking or interest. Alternatively they push the problem into the distant future, and therefore, negate

the need to worry about the problem in the present (Table 4.11). Although Old Wilhelmsburgers were not found to employ any 'do not think about it' strategies, both Old and New Wilhelmsburgers (here inclusive of students and immigrants) employed postponement strategies.

Emotive or affective strategies are largely related to the sense of safety that informant's feel in their lives. These are related to their reliance on and trust in the dikes and city authorities to carry on protecting them, a variable that is strengthened through the time that has passed since 1962 without a subsequent flood incident. Despite a number of storm surges (1976 & 78) in the intervening years that surpassed the water levels recorded in 1962. This sense of safety has the effect of reducing the threat appraisal of informants substantially (Figure 4.14), as can be seen from their responses in Table 4.11.

Situational strategies, work not so much in reducing the threat appraisal of informants', but reduce their fear, concern or worry (stress) by providing them with spatial or social reasons not to have to carry out any protective responses to reduce their risks (Table 4.11). Spatially, things like living on the floors above the perceived level at which the flood water would come (connected to their awareness created through the flood markers from the 1962 event), or living in areas perceived or known to be higher and less vulnerable (due to knowledge on where flooding was worse in 1962 or of the geography of the island) - "*I live on the 5th floor I don't need to leave. Till the 5th floor the water will never go. Just what's on the ground floor, 2 to 3 metre*" (P8). Socially knowing someone (friends or family) who lives on higher floors, outside Wilhelmsburg (North Hamburg), or on higher ground, brings comfort (Table 4.11).

Chapter 5 Badda, Dhaka City - Living with floods

This chapter presents the exploration of contextual, informational, cognitive concepts believed to be influencing the Flood Protection Motivation of residents in Badda. The following sections present the findings from the exploration of these concepts. All sections except for Section 5.1 (context) are based on analysis of interviews and observations; Section 5.1 is based on the author's reading of the available documentation and literature as well as her experience and observations in Badda (and Dhaka) (more in depth description and exploration on context is available in Appendix C, Section C.1).

As with the Wilhelmsburg site, informants' perceptions are explored in this study and are interpreted (by the author) as the experience and perceptions of the informants of this study at the time of data collection (March - May 2012). Figure 5.1 presents the layout of this chapter.

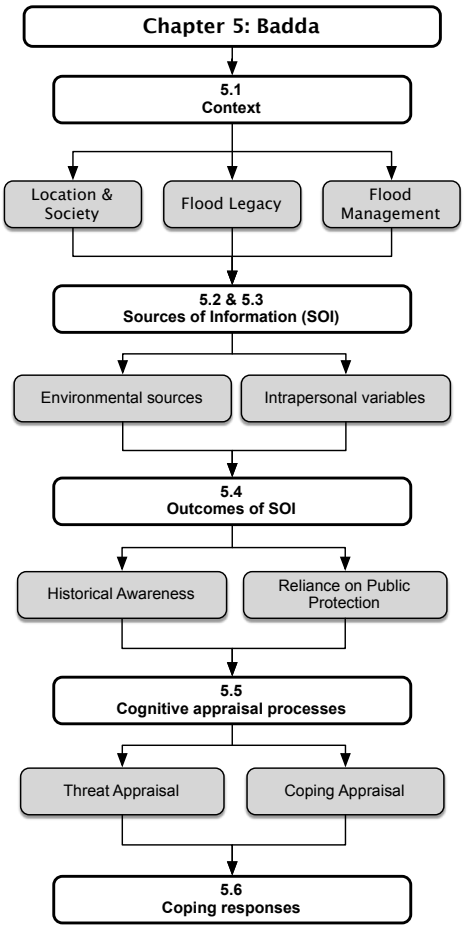
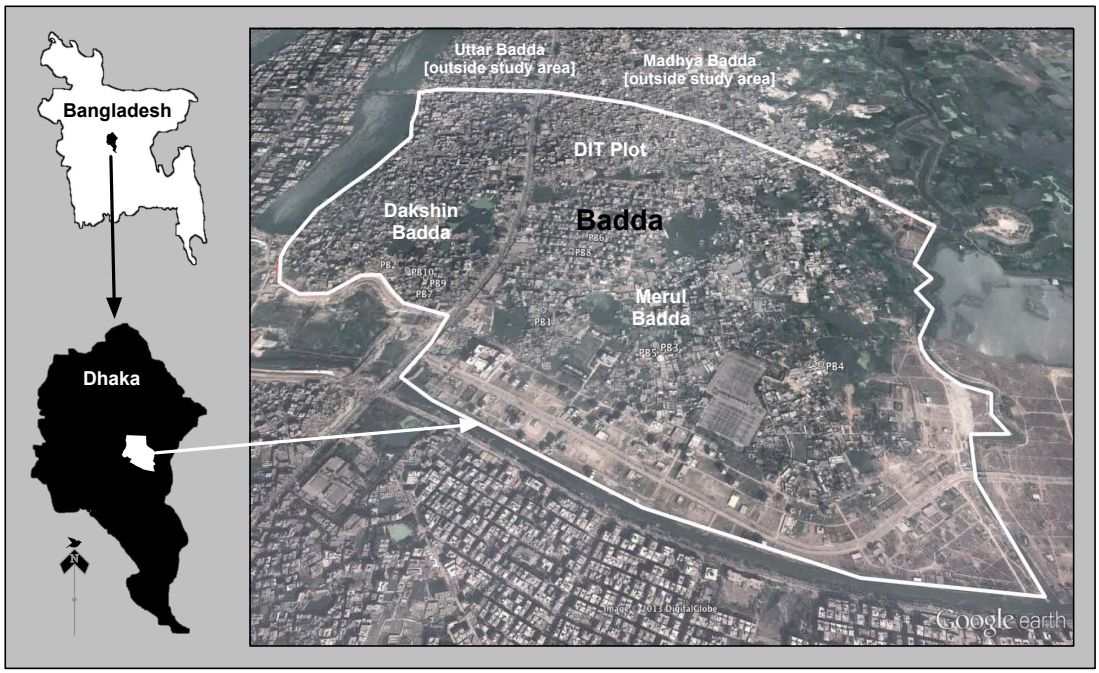


Figure 5.1 Chapter layout and breakdown.

5.1 Badda, Dhaka City: a community well acquainted with floods

5.1.1 Location & society

Situated on the Granges-Brahmaputra-Meghna Delta (the world's largest delta) in Southeast Asia, Bangladesh has the precarious honour of being one of the most disaster prone countries in the world. With recorded incidents of: flooding, earthquakes, cyclones, tornados, riverbank erosion, droughts and anthropogenic hazards such as poisoning of underground water (Horwood, 2007) (Figure C.1; Table C.6). Dhaka City is the capital city of Bangladesh, and the main site for this small country's political departments and government. Situated in the centre of Bangladesh in the Dhaka district (Figure 5.2), the city (Dhaka Metropolitan Area, DMA) is nestled between four major rivers and waterways: the Turag on the west, the Buriganga on the south, the Balu on the east and the Tongi Khal on the north (Figure C.2).



(Source: Google maps)

Figure 5.2 Location of Badda in Dhaka, and it suburbs.

Dhaka is the administrative and financial headquarters for Bangladesh. The ready-made garment industry in Bangladesh is one of the most important revenue sources, and 80% of this industry is based in Dhaka (ISFD, 2011). In

addition, Dhaka accounts for 80% of all national enterprises, 100% of jobs related to rubber production, 97% of furniture production, 96% of publishing, 84% of footwear manufacture, 82% of leather goods production, and 72% of electrical machinery production (PDC, 2006). As such Dhaka attracts migrants from all over the country. Some of these migrants come to stay (permanent migrants) and others commute to and from the city (floating populations) (PDC, 2006).

The UN's Population Division of the Department of Economic and Social Affairs (2013) indicates that the country's urban population has increased by more than 22 million people since 1950 (to 2013) (Figure C.1). In Dhaka population expansion has lead to unprecedented growth of the city on several levels (i.e. industrial, commercial, administrative, infrastructure and services, roads, water supply, sanitation, sewerage) and uncontrolled expansion (Hossain, 2006; Ishtiaque et al., 2014). The complications of uncontrolled expansion and growth include development of large slums, poor housing, excessively high land prices, traffic congestion, water shortages, poor sanitation and drainage, irregular supply of electricity, unplanned construction, increasing air pollution, and poor urban governance (World Bank, 2007). 30% of Dhaka's population consequently lives below the poverty level[32] with most living in informal settlements (Haque et al., 2010).

Local socio-cultural characteristics of Dhaka are all representative of rural: religious perspectives, music and drama, accents and expressions, food recipes and national dress (Hossain, 2006a). Most residents are Muslim, with a few Hindu communities being situated in the east of the city. Social hierarchy plays a significant role in creating social perceptions based on income and occupation, power, social position and networks (World Bank, 2007). For the most part, the structure of municipal governance leaves little scope for participation by the urban poor, in fact they were only granted voting rights in 1994 (Banks et al., 2011).

[32] Poverty level (or poverty threshold or line) is the minimum level of income considered adequate in a particular country, in Bangladesh the national poverty level is US$2 per day.

Badda is a *Thana*[33] in the east of Dhaka City (DMA) (Figure 5.2) made up predominantly of Muslim communities. The main road that runs through the centre of Badda acts as an embankment against flooding. Therefore, those on the west are provided some protection from floodwaters from the Balu River. However, those living east of the road are vulnerable to flooding from the Balu River as well as water logging. Informants were interviewed in the southern suburbs of Dakshin Badda (west of the Airport Road) and Merul Badda (East of the Airport Road).

5.1.2 Flood legacy

Flooding is a way of life to the people of Bangladesh and Dhaka. Eighty percent of the country is situated on flood plains (Figure C.8), which are submerged two to five months each year during the monsoons (Islam, 2004). In Dhaka flooding is caused by three main sources (Faisal et al., 2003):

- Fluvial floods (i.e. monsoon river floods);
- Pluvial floods (i.e. local-rainfall floods);
- Urban sources (e.g. water logging & drainage congestion).

In most major floods, all three play a role in exasperating the situations (Faisal et al., 2003). Since 1950, Dhaka has experienced 10 major floods in: 1954, 1955, 1970, 1974, 1980, 1987, 1988, 1998, 2004 & 2007 (Figure C.1; Table C.6). The 1988 and 1998 floods still exist in local [living] memory as being the most catastrophic (Huq & Alam, 2003).

The 1988 flood inundated 85% of Dhaka City (Huq & Alam, 2003) (Table C.2). 60% of residents (+/- 2.2 million people) living in Dhaka were affected, and an estimated 4 billion[34] Taka[35] worth of damage was done to residential buildings (Huq & Alam, 2003). The flood cut off Dhaka's communication with the rest of the world for about two weeks, and disrupted air travel into and from the city

[33] City sub-district
[34] US$1=Tk32.925 in Nov 1988, at that exchange 4 billion taka worth of damage = +/- 12 million US$.
[35] £1 is roughly equal to 130 Bangladeshi Taka (April 2014).

(Huq & Alam, 2003) (Table C.2). 2.5 million people were left stranded in Dhaka, most living for weeks with little to no food, drinking water, sanitation, shelter and health care (Mallick et al., 2005).

In 1998 excessive rain in the Ganges-Brahmaputra-Meghna catchment area resulted in prolonged flooding in Dhaka (Faisal et al., 2003; Huq & Alam, 2003) (Table C.2). For between 8 to 9 weeks all of Dhaka east and 20% of Dhaka west was inundated (Ahmed et al., 1999; Faisal et al., 2003). The flood resulted in widespread damage to infrastructure (384km of paved roads) and housing (30% of housing in Dhaka) (Huq & Alam, 2003); severe losses to business revenue through the disruption of government activities (Mallick et al., 2005); schooling was disrupted because children could not come (Haque et al., 2010); and millions became sick from exposure and drinking of contaminated flood waters (Huq & Alam, 2003).

In 2004 two different [hydrological] flood events hit the residents of Dhaka. In April, early monsoon flooding in the northwest of Bangladesh resulted in fluvial flooding in Dhaka in early July (BDER, 2004). In mid September a localised low-pressure depression caused six days of torrential rain (10th to 16th) in central Bangladesh (BDER, 2004). In a 24-hour period over 341mm of rain fell on Dhaka City (Tawhid, 2004), the heaviest rainfall event recorded in 50 years (BDER, 2004). These floods lasted for months impacting east Dhaka (Badda) the most, as overflow from the Balu River (Figure C.9) inundated the entire area (Table C.2). West Dhaka was largely spared because of Dhaka's Flood Action Plan (Table C.2); however, water logging and the absence of gravity drainage caused some urban flooding behind the embankments (Rahman et al., 2005).

In general the characteristics of the 2007 flood were not as dramatic as the previous three (Islam et al., 2008). Most of east Dhaka was again affected by these floods, which again highlighted the vulnerability of this part of the city (Islam et al., 2008).

5.1.3 Flood management & defence

There is no single authority for the management of wetlands in Dhaka; therefore, there is a lack of co-ordination and communication around the issue of canal maintenance and protection (Mahmud et al., 2011). In 1998 a lack of coordination among management authorities contributed significantly towards prolonging the drainage congestion of the city (Faisal et al., 2003).

Dhaka's flood protection is made up of both structural and non-structural defences. Up until the 1988 flood, Dhaka's structural defence against fluvial flooding was minimal and most areas were affected during floods. After the 1988 flood the government adopted the UN Development Program and World Bank's sponsored Flood Action Plan (FAP) to protect the city (as much as possible) from the impacts of further floods (Rasid & Mallik, 1995). The western phase of this plan was completed in 1992; the eastern phase has yet to be started (Chowdhury, 2003) (Figure C.9).

The 1998 flood was the first major flood to occur after completion of the western phase, and although almost all of east Dhaka was flooded, only 20% of west Dhaka was inundated (Faisal et al., 1999), indicating that the FAP was somewhat successful in protecting west Dhaka from floodwaters (Das & Islam, 2010). However, floodwater did enter this part of the city through hydraulic leakages (buried sewerage pipes, breached and/or incomplete flood walls, un-gated culverts and inoperative regulators) and poor co-ordination between authorities (Das & Islam, 2010).

Although a number of insurance companies exist in Dhaka: Jeebon Beema, Meghna Life Insurance, Green Delta Insurance, Delta Life Insurance, Pioneer Insurance to name a few (Gourbesville & Batica, 2011a). Natural disaster related insurance in Bangladesh and Dhaka is still in the planning stages (Gourbesville & Batica, 2011a).

The nature of floods and the urban environment of Dhaka means that non-structural flood activities are diverse and utilised by a number of different social units (i.e. individuals, groups of people, households, NGOs and the

Government of Bangladesh –GOB) (Faisal et al., 1999) (Table C.5). Non-government Organisations (NGOs) represent a significant group in helping improve flood-vulnerable communities' resilience to floods, by teaching them prior to the floods to save and prepare for floods, provide relief during a flood and support in the recovery of floods (Paul, 1997).

5.2 Intrapersonal variables of informants

This section explores the intrapersonal SOI: personality variables and prior experience.

5.2.1 Urban-poor Muslim women

The informants of this study are all women from urban-poor communities in south Badda (Figure 5.2); as such they represent some of the poorest and most marginlised social groups in Bangladesh (Hossain, 2006). On a daily basis they can face multiple forms of discrimination and threats including: lack of income or employment; abuse; sexual harassment; lack of shelter and constant eviction from homes and workplaces (Hossain, 2006). Following the current trends (Huq-Hussain, 1996), all informants are long-term migrants originating from rural localities, they have all lived in Badda for over ten years (between 10 and 30 years). Informants came to Dhaka either because of marriage migration[36] or as dependents with parents who migrated to the city. Table C.7 presents the attribute information for the different informants.

Living in slum[37] settlements they all live in either (single storey, most often single room) *semi-pucca*[38] or *katcha*[39] homes. Are aged between 28 and 45 years and for the most part are housewives. Three informants are self-employed and provide tailoring services from their homes to subsidize their family's income; one informant is employed as a primary school teacher. They

[36] Reason for coming to Dhaka was because they married a man living in Dhaka, their initial accommodation in the city was arranged by their husbands (Huq-Hussain, 1996).
[37] Legally established dwelling, normally characteristically run-down and occupied by residents who pay rents to owners occupying residents elsewhere (Huq-Hussain, 1996).
[38] Brick walls and tin roof (IWM-DWASA, 2006).
[39] Walls of bamboo or other more temporary material (IWM-DWASA, 2006).

are all married and have between one and six children. The primary earner in all informants' families is their husband, whose professions include: car driver, *vangari*[40] puller, security guard, and rickshaw and CNG driver.

Given cultural (*Purdah*[41]) and religious norms much of these women's lives revolve around their homes (Mahmud, 2003). As Muslims, their homes make up a core part of their identities, and their husbands or fathers represent the head of these homes. They live with cultural norms concerning how to dress and behave, and anything that prevents them from being able to carry these out brings much shame and distress (Rashid, 2000; Rashid & Michaud, 2000). Floods represent an event that impact on their homes, their propriety, their family and their personal shame and identity (Rashid, 2000); and as such causes them much concern.

5.2.2 Prior [direct] experience

Informants in Badda all had prior experience with flooding, and could all recall and name (by year) the major flood events that have happened (specifically those within their lifespans). Although major floods do not take place on an annual basis, flooding is a normal part of the informants' lives. In discussing flood experience with informants three main themes emerged: impacts (challenges & difficulties) experienced; response actions; & incidents or events that stand out. Given that these themes crisscross other aspects of the conceptual framework, they have been broken up. The following explores the theme of 'impacts'. Events that stand out are discussed in regards to historical awareness (Section 5.4). Response actions are explored in Section 5.6 looking at coping responses.

The informants in this study are largely on the front lines when it comes to living with floods and having to cope with their impacts and effects. Large flood events have left a lasting mark on the minds and hearts of the communities

[40] A three-wheeled bicycle with a flat bed (carry area) at the back see Figure C.21.
[41] General segregation of domestic & workplace spaces in Islamic countries, maintains a strict & separate domain for males and females (Mahmud, 2003).

impacted by them. Seven different aspects (areas) of informants' lives were identified as being impacted by floods:

1. Impacts to physical context;
2. Impacts from secondary hazards;
3. Impacts to financial resources;
4. Impacts to travel;
5. Impacts to health and well-being;
6. Impacts to social context (family and community);
7. Impacts from evacuation and recovery.

Tables 5.1 present a summary of these different aspects as well as brief descriptions of impacts associated with each. More in-depth and extended exploration is provided in Appendix C, Section C.5, and the following presents the core findings from this exploration.

Table 5.1 The impacts to the different aspects of informants' lives due to floods.

Aspect of life	Categories impacted	Impacts
Physical context	Home/house	• Have to leave; • Have to live on the roof; • Can't get out of house due to water in the streets; • Flood water comes into house; • House damaged by floodwaters.
	Belongings	• Get spoilt by flood waters; • Get broken or damaged or lost; • Get looted or stolen; • Clothes get wet – clothes; • Have to be raised to protect belongings; • Have to be left behind &/or replaced.
	Utilities: Water, waste & Electricity	• Tube well goes under water; • Difficult to get clean drinkable water; • Have to fetch clean water; • Bathroom (toilet) submerged; • Water contaminated by sewage & rubbish; • No electricity.
Secondary hazards	*Macha* & bridges	• Fall through gaps of bamboo bridges; • Bridges break; • *Macha* collapse; • Fall off *Macha* & bridges.
	Pests	• Snakes; • Insects, centipedes & ants; • Red ants in beds; • Mosquitoes.

Aspect of life	Categories impacted	Impacts
Financial resources	Work	• Husband can't work (difficult to drive, or cant get to work); • Can't sell sarees & other produce; • Takes longer to get things done.
	Money	• Have to borrow money: • Fall into debt; • Reduced to no income; • Unable to buy food; • Forced to sell land or other property; • Fewer people available to borrow from.
Travel	Roads	• Have to walk through dirty water; • Get stuck or slip in the mud; • Cars fall into water; • Rickshaws still try to pull; • Difficult to move about: • Need a boat. • Can't see holes in the road.
	Boats	• Cost money to hire; • Not always available; • Can sink or capsize; • Boats enable thieves to steel belongings.
Health & well-being [directly]	Health	• Increase in sickness & illness: ○ Diarrhea, dysentery, jaundice, typhoid; • Injury (fall, slip); • Allergies; • Fungal attacks; • Boils on feet & body; • Infections; • Drowning; • Unable to sleep; • Minimal access to medical help.
	Well-being	• Anxious for family & children; • Difficulty sleeping; • Suffering - water in house; • Family cramped together - hot; • Get wet, have to swim/walk in dirty water; • Evidence of death in the community around - illness & floating bodies; • Pregnant at time; • Responsibilities of daily life still present; • Fear, frightened; • Loss of tempers; • Watching family & loved ones have to deal with extreme hardship; • Inability to help.
Health & well-being [indirectly]	Clean water	• Need to fetch for a far; • Thirsty/dehydration; • Spread of disease & illness.

	Food	• Reduced access & availability:
		  ○ Can't get to market;
		  ○ Have to go hungry;
		• Reduced ability to cook & prepare food:

Aspect of life	Categories impacted	Impacts
		○ Stove goes under water; • Lack of firewood.
	Sanitation, waste & ablution	• Toilets under water; • Sewage floating on the top of water; • Rubbish disposed of into the water.
	Help & relief	• Being able to be of help; • Given dried food (rice & lentils) & soap; • Not enough; • People do not readily give help; • Little help from outside - must help selves; • Relief stolen by authorities & officials.
Social context	Children	• School: ○ Carry Children to school so they do not get wet; ○ Water in class rooms - muddy & slippery; ○ Books get wet; ○ Closed. • Get sick/wet; • Fall through gaps in the bridges; • Can't get to school, can't do exams; • Can't get out of the house to play; • Increase in hazards that could hurt or make them sick; • Can't always be watched (to ensure they do not get hurt); • Get/go hungry; • Drown; • Cause worry & anxiousness; • Suffer; • Need help to handle.
	Husband	• Can't work; • Has to go away to find work; • Takes children to shelter.
	Community	• Families leave Commuting & communication routes breakdown.
Evacuation & recovery	Evacuation	• Conditions at shelters; • Need to leave belongings; • Need to find somewhere to shelter: ○ Nearby buildings (under construction); ○ Live on the streets; • Move to village; • Move to relative's houses.
	Recovery	• Takes months; • Duration of standing flood waters; • Results of receding water leaves: ○ Stench; ○ Rubbish in houses; ○ Increased sickness & vulnerability to sickness; People start returning to their homes.

It's clear from Table 5.1 that informants face a wide spectrum of impacts to various aspects of their lives. Its also identifiable that although each set of

impacts can be categories relative to individual life aspects, they are also interconnected, and impacts can have direct and indirect effects on other aspects of informants' lives. Figure C.18 presents a map of the impacts and their interconnection on the different aspects of informants' lives.

Impacts to physical context

Three categories have been identified relating to impacts to informants' physical context (Table 5.1):

- 'Water in the house',
- 'Belongings', and
- 'Utilities'.

The impacts that occur when water gets in informants' homes represent characteristics of major or bad flood events (Table 5.8). Although, in general they are accustomed to the flooding of roads and streets from monsoon rains and poor drainage, these events do not invade informant's personal space. The 'home' to women in this study represents a space that forms a significant part of their identity as Muslims. Their faith directs them to stay in the home, to look after their husbands and children's comforts prayerfully and dutifully[42] (Farooqi, 2010). As such the women in this study are bound to their homes most of the day. Their homes enable them to fulfill their purpose as women, wives, and mothers, as such their homes are an important part of their identities. In addition, some of the women in this study use their homes in income generation (garment and tailoring services), therefore, their homes are not just a space for life, but also life-sustaining activities. Inability to meet spiritual and cultural expectations carries social stigma and opinion (judgement); within a hierarchical society encountering social disapproval carries implications not just for themselves, but their family at large (Rashid, 2000). Therefore, when a flood invades and for a time 'takes over' their home,

[42] The Quran commands Muslim women to 'stay in your homes' in order to guard their chastity and not to flaunt their charms and beauty in anyway, and make their homes the centre of their affairs (Farooqi, 2010).

emotional and psychological impacts are extensive - "*Yes, when the water comes in. Feels like everything will be lost.*" (PB8).

Other impacts associated with a flooded home include restrictions to getting out which in turn affect informants' ability to (Table 5.1; Table C.8):

- Go to the market;
- Fetch their children from school;
- Sell sarees, and
- Interact with other members of their family and community.

Not being able to achieve these tasks limits informants' ability to get food, make money, and look after their families. Water entering into the home, is thus a source of psychological, emotional, financial, cultural and spiritual trauma, which are impacts that can lead to suicide as one informant indicated "*When can a mother commit suicide? She couldn't take it anymore… the struggles that we were going through… so she* [PB10's mother] *committed suicide…*" (PB10). In addition, having water in their house also makes them vulnerable to snakes, pests and illness (Table 5.1; Table C.9, Table C.12a & b), or other hazards like rolling off platforms - "*Many people died… A girl died here… she rolled off the macha and fell in the water…* " (PB10).

By and large one of the largest impacts informants associate with flooding is the tangible damage to their belongings because of the water, and loss of them due to theft (Table 5.1). However, informants did state that during a flood their belongings are not always a priority. Box 5.1 lists some of the responses from informants that suggest belongings are readily sacrificed during extreme situations.

Box 5.1 Informants' responses suggesting prioritization of life over belongings in extreme events/situations.

- *"If the situation* [scenario described to them in interview] *is that bad no one would care about their belongings. At that time* [flood is on its way] *we just want to save ourselves. We don't think about our belongings at that time.*" (PB5);
- "*I will be cautious and go somewhere safe with my family. We can worry about the belongings later. If we are alive we can get more belongings later* [after hearing that a flood was coming the next day- scenario]." (PB8);
- "*If the house is left without anyone in it things get stolen. Because at that time* [from personal experience] *no one worries about belongings everyone thinks about how to save themselves…*" (PB9).

An interesting dilemma one informant described is that in many situations belongings cannot be taken with during an evacuation because others who might be willing to provide them shelter are not able or willing to provide them shelter if they arrive with their belongings as well - "*All of our belongings were here. If we left them, during the time of flood if someone raided our house and took everything away on boat… we won't be able do to anything… and if we left with our belongings no one would take the trouble to provide shelter for us…*" (PB5). The same informant also said that when it came to getting flood warnings - "*The sooner the better* [to get warning]. *If we can know sooner, then we would be able to save more of our belongings… But if it is very sudden then that's a problem*." (PB5).

In terms of utilities, most informants have to fetch their own water from community taps, or use tube wells. These become submerged during floods, forcing them to have to seek out clean water elsewhere (Table 5.1). This most often requires walking through the dirty water which carries with it high levels of discomfort and risk of contracting illness and diseases. In addition the bathrooms also become submerged, making it difficult for informants and their families to keep their 'own activities' hygienic as they are forced to go to the bathroom directly in the water, or in plastic bags that they then dispose of directly into the water (personal communications, 2012). In terms of electricity supply informants' 'normal' supply is sketchy at most, with informants saying they usually only get about an hours worth a day. However, during floods there is no electricity, which impacts informants with electric stoves.

Impacts to informants from secondary hazards

Secondary physical hazards are here seen as those things that present a risk to informants not from the flood directly, but that are facilitated by the flood indirectly. These hazards themselves do not include illness or health related impacts, however, could result in these impacts. The two secondary hazards discussed by informants were (Table 5.1; Table C.9): *Macha* (bamboo platforms constructed by informants to live on and/or store furniture) and bamboo bridges (Figure 5.3), and Pests (e.g. snakes, ants).

(Photographs used with permission from Food For the Hungry)

Figure 5.3 Photographic examples of wooden platforms, macha (bamboo platforms) and bamboo bridges (2004 floods, Badda).

Platforms like the bamboo *machas* and bridges (Figure 5.3), are constructed as coping strategies to facilitate storage of belongings, places for the family to live, and means by which to travel safely and stay dry in times of flood events. However, these structures according to informants' carry with them their own degree of risk and impact. In terms of *macha* and bridges, the biggest danger occurs in falling off them. This places informants at risk of hurting themselves from falling, getting sick from being in the contaminated water, and in extreme cases drowning, because they may not be able to swim - "*I did feel scared at that time. I couldn't swim, I was very scared. What if I fall down?*" (PB5). Several informants recounted having their children slip off these structures, and having to dive into the water to get them out before they drowned (Table C.9).

A common topic brought up when talking about the difficulties informants' experience during floods, are the pests (Table 5.1). The list of pests informants are exposed to include snakes, ants, mosquitoes and other insects (Table C.9).

Of these the most common are snakes, which are more than just an annoyance, their potential to cause serious harm or even death, makes them something informants fear - "*There is the fear of snakes when it floods* " (PB9); "*The scariest things are the snakes. Snakes are worse than the food crisis…*" (PB10). Getting medical attention for a snake bite during a flood is difficult as the injured person can not easily, and swiftly, be taken to get medical help - "*One of my nephews was sleeping and he got bitten by a snake and he died. He was on a macha… There were a lot of snakes at that time… Water is everywhere, where will we go? We couldn't take him to a doctor.*" (PB10).

Impacts to financial resource

Flooding events impact the informants financially, principally because they have so little to start with. In terms of financial impacts, informants discussed two categories (Table 5.1; Table C.10):

1. The inability to work or continue income-generating activities during a flood, and
2. The lack of money in general.

The biggest financial difficulties result from informants' husbands, or themselves, not being able to generate an income the same way they manage when it's dry. Most informants' husbands were drivers, who work in the more affluent and diplomatic areas (e.g. Gulshan and Banani). A few informants suggested that their husbands simply didn't come home during floods if they could still work in other areas. Others said that during bad floods, it wasn't possible to continue working and this meant that there was no income coming into the household during these events (Table 5.1). Those informants, who sewed sarees or tailored clothes to bring in additional income into the household, described how they were limited in how they could continue with these actions during a flood (Table C.10).

Informants never mentioned any alternative strategies they have for earning during a flood. One informant put it like this - "*At that time income sources were limited…*[do you have other ways of making any income during a flood?] *No, we did not have any other ways, people who bought boats they had that chance,*

but not us…We need money to do anything at all: we had no money to begin with…" (PB7). Informants discussed how loss of income means they need to find money through borrowing, or through selling available property (Table 5.1). Borrowing money may not be easy during floods and generally means that the household falls into debt (Table C.10).

Impacts to travel

Two main travel impact categories were talked about by informants (Table 5.1; Table C.11):

1. Impacts due to the flooded roads themselves, and
2. The impacts resulting from having to utilise boats to get around.

Figure 5.4 shows some photos (taken during the 2004 floods in Badda by representatives of Food For the Hungry) of the flooded streets; on the left are photos illustrating the use of boats, and on the right people having to walk waist deep in dirty flood water to get where they are going.

Informants described flooded roads as being a source of a number of problems (Table 5.1):

- Having to walk through the contaminated floodwaters (Figure 5.4).
- The high turbidity of the water hides ditches, drains, potholes and any other uneven surface or obstacle on the roads (Table 5.4; Figure C.15).
- Having to carry their children to school;
- Restricted ability to go out;
- Fewer costumers available to buy sarees.
- Husbands have a reduced ability to work because of flooded streets.
- Flooded streets necessitate the use of boats.

(Photographs used with permission from Food For the Hungry)

Figure 5.4 Images of flooded streets, on the left the use of boats, on the right the need to walk through the floodwaters.

Travel by boat carries it own suite of impacts and hazards (Table 5.1). First off, to hire a boat costs money, an asset that is not readily available to informants during flood events, and one informant stated that having to hire boats to try to sell her sarees ate into her profit and ultimately contributed to her debt - "[do you use a boat?] *Yes, but no one wants to buy sarees at that time anyway, because they struggle to buy food at that time. Who will buy a saree, and whatever profit we make we have to use that to pay the hired boat. We fall in debt at that time.*" (PB1). Boats in Dhaka are not always available and not being able to hire a boat can impact on an informant's ability to get or provide help for the ill or can also cause important events or appointments to be missed or arrived late for - "*We travelled outside on boats. So we always used hired boat...yeah. One time didn't get a boat in time. We were 40 minutes late for our exam.*" (PB2). In addition, informants described how boats would often capsize or sink - "*Sometimes the boats couldn't go, they used to sink. If the wind or current was too strong it would sink*." (PB4); "*We suffered worse than*

manholes. The bamboo bridges broke while we were walking on it, boats got capsized…" (PB7).

Impacts to health & well-being

An important range of impacts informants experience during floods, are those relating to their (or their family's) health[43] and well-being[44]. These impacts influence most other aspects of life (e.g. context, finances, travel, family etc.) and directly affect informants' ability to withstand and rebuild. In exploring the impacts described by informants during their interviews, two groups of sub-categories were identified as relating to health and well-being (Table 5.1).

1. Group 1 included direct impacts to health and well-being (Table C.12a);
2. Group 2 included indirect impacts on informants' health and well-being (Table C.12b).

Impacts to health are some of the most concerning to informants. Being sick or injured greatly increases their (or the sick member of their family's): vulnerability to other impacts, death, inability to get help or medical aid, and ability to fight the general hardships associated with floods.

Floods pose many direct impacts to informants' health (Table, 5.1; Table C.12a). Contaminated floodwaters result in skin diseases and irritations (rashes, allergies, boils, fungal infections) (Box 5.2). Exposure to dirty and stagnant waters also increases the chances of other illness such as Dysentery, Jaundice and Typhoid. Alternatively just being wet increases the likelihood of colds and fever (Table 5.1).

[43] The use of the term 'health' here denotes the physical wellness of the people, and includes aspects such as illness, injury, allergies, and death. All physical impacts affecting informants anatomically and/or physiologically.

[44] In terms of 'well-being' the term is here used to describe more abstract aspects of people's make up. Aspects such a psychological issues e.g. stress, fear, cognition and emotions (Table 5.1).

Box 5.2 Informants responses describing skin complaints due to exposure of contaminated water.

- "*We get many diseases… skin diseases, we get rashes and allergies in our hands and feet, we suffer from diarrhoea, children suffer from fever…*" (PB7);
- "*When we got down in the water we got hurt many times. We had fungal attack on our feet, our feet went white* [2004]." (PB8);
- "*My daughter used to go to work walking though that water which was at her chest level. She had boils all over her body…*" (PB10).

Besides illnesses, injuries are also more likely during floods - "*We can slip any time.*" (PB2). Several informants mentioned they or their children could not swim, not having this skill places them at risk of drowning should they fall into a deep area where they can't stand - "*I myself don't know how to swim. I almost drowned here once. Someone pulled me out of the water.*" (PB5).

Flooding is a source of fear for informants, and fears over the safety and health of their children appear to be a prominent category that emerges from informants' responses[45]:

- "*I don't get out much. But if I do than my biggest concern is about my children. What if they fall in a ditch? What will happen if they do? I worry about those things.*" (PB5);
- "*There are many problems. We are worried about the children mostly, if we can't live here with the children we go to our relatives' house*." (PB9).

Such fears keep informants up at night, and causes lose of sleep (Table C.12a).

Other sources of anxiety and stress include (Table 5.1; Table C.12a):

- Getting an illness due to walking in the water;
- Lack of sleep due to skin irritations (and pests Table C.9);
- Discomfort at being wet most of the time;
- Difficulty in undertaking daily tasks and routines;
- Inability to socialise;
- Short tempers and lack of peace in the home.

Having to live in hot-cramped conditions[46] makes it difficult for household members to not start getting irritated and/or annoyed with other family members, and tempers can irrupt.

[45] This is not surprising given the informants are all mothers.

Indirect impact to informants' health and well-being include (Table 5.1; Table C.12b):

- Difficulties related to getting clean drinking water;
- Difficulties in feeding themselves or family due to access to food issues;
- Impacts to sanitation and hygiene facilities; and
- Reduced ability to help or get help.

Not being able to get food during floods is linked to impacts on: utilities (i.e. water supply & electricity for cooking); being able to work, and available monies in the household; ability to travel and get out of the house to get clean water and food; in some cases health issues can prevent informants from being able to get clean water and food; or having access to help and relief. In not having a constant and reliable supply or availability of food and water, informants and their households are placed under stress. Malnutrition can lead to weakness and reduced capacity to resist illness and other health impacts. One informant implied that during periods of hunger, condition of available food becomes less important - "*Whatever I could get I ate. I was more worried about whether I would be alive or not…*" (PB7). Having to eat poor or spoiled food can lead to additional health impacts such as illness, and even death.

Unhygienic conditions have direct impacts on both informants' health and well-being. Frequent exposure to human waste floating or breaking down in the water, as well as household waste disposed of in the water significantly increases chances of illness and disease. Being aware of the exposure, and living with the visual and olfactory evidence has an impact on the psychological well-being of informants and their families - "*There is no longer the opportunity to drink water from tube well, the children find it problematic to go the bathroom since the sewage floats on water, it's not possible to walk on the roads, the children eat their food with disgust, diseases occur…*" (PB3).

[46] Up to six people on a platform in one small room, in Dhaka's hot & humid climate.

Impacts to family & community (social context)

Family by and large represents an important form of social capital and support to informants - "*My family is there, my husband said, family is there, if we live we live together, if we die we die together…*" (PB10). Informants repeatedly emphasized the concern they had for their children during floods - "*I don't get out much. But if I do than my biggest concern is about my children. What if they fall in a ditch? What will happen if they do?* " (PB5). The health and safety of their children was discussed above their own, and it was observed, by the author, that it was a point of great significance that she be aware of the lengths they went to protect their children. Box 5.3 lists informants' descriptions of how they protect their children. Impacts informants experience in relation to their husbands occur as a result of him not being able to work and bringing in an income (Table 5.1; Table C.13).

Box 5.3 Informants' descriptions of ways they protect their children, and the importance of saving the children during floods.

- "*I did that [tie children with a string so they couldn't fall into the water], didn't matter if they cried. It was done so that they may not fall in the water*." (PB1);
- "*We carried the children on our shoulders to their school… We got wet ourselves but we didn't let our children get wet*." (PB6);
- "*We have to raise the belongings, save the children*" (PB8);
- "*There are many problems. We are worried about the children mostly. If we can't live here with the children we go to our relatives' house*." (PB9);
- "*No. I taught my children, stay away from water, don't drink the water, don't play in the water*." (PB10).

Community represents an important aspect of informants' lives. Box 5.4 lists some supporting comments regarding informants' feelings of connection with their community. A significant social impact of flooding on the informants is the scattering of members of their various communities, 'suffering' of their kin and friendship networks, and removal of themselves from their community contexts either because they go to family in villages, or because they have had to evacuate and leave their home and area.

Box 5.4 Informants responses regarding their sense of community and feelings of connection with it and within it.

- "*Of course* [feel connected to the community]. *I love all the people in this community*." (PB2);
- "*Everyone lives here together in harmony, everyone is nice*." (PB4);
- *"…everyone here is like my family. We have our actual family members around this area too. Everyone knows me, they know my name. The new tenants that come I get familiar with them gradually. But there are many people who have been here for a really long time. I know all of them*." (PB5);
- "*Yes, very good relationships...we are like families…*" (PB6);
- "*Why wouldn't I not like this place? I'm living here, I know all the people. When I am in danger I get help from them. When someone else needs help we do the same for them. So isn't it better for us if we knew each other? I think everyone is very close to me… when you think otherwise they won't be close to you. I feel like everyone is my kin*." (PB7);
- "*If you live here in one place for a long time everyone becomes close to you. My neighbours have lived here for more than 10-15 years. Everyone is like my relative. My actual relatives live far away so I think everyone in my community as my relatives. That's why I live here and I feel safe*." (PB8);
- *"…We help each other when needed, I always get help. They are like family*." (PB9);
- "*We know everyone and everything. Everything became close to us… That's why we love it here*." (PB10).

Impacts to evacuation & recovery

The last set of impacts relate to having to evacuate during a flood event, and to the difficulties informants mentioned in relation to events post the flood, and during recovery (Table 5.1; Table C.14). In extreme events informants are forced to seek shelter elsewhere. Having to leave their property carries direct tangible consequences, in that their belongings and homes become more vulnerable to thieves and vandals (Table 5.1). It also carries a significant amount of psychological trauma. Social disruptions are increased with the departure and scattering of community and family members - "*I was at home. But the children and their father went to Khulna because they were too little and the water here was too dirty…*" (PB8). Evacuation shelters (Figure C.17) are crowded which means informants who had had to go to them, found themselves surrounded by many who were not from their communities, and unknown to them - "*That was the most painful experience.* I*n a school in Rampura. We lived there for a month. There were thousands of people over there. We couldn't cook and eat ourselves, we starved the whole day.*" (PB1); "*If we live in a school we can see 300 people we have never seen before…*" (PB7). Not being able to eat properly at the shelters due to the small rations provided can lead to malnutrition and ill-health, and the high concentration of people in one place means the spreads of any contagious diseases occurs more rapidly.

The difficulties and problems informants experience during floods are not over when the waters begin to recede (Table 5.1), in fact one informant said that the time following the floods were often worse than the event itself - "*There were more problems at that time* [after the flood]*. When the water level goes down we get a lot of rubbish in our house…"* (PB8). As the water recedes, rubbish and mud are left in its place and illness and disease spreads. An informant then faces the big task of cleaning and putting their homes back to right, with this task comes inconvenience, discomfort (smells, mess, rubbish) and shame at the state of their property. The process of recovery takes months (years in the case of extreme events), and leaves informants and their families vulnerable to future events and social pressures.

5.3 Environmental SOI in Badda

Exploration of the SOIs that carry a flood risk or coping message in Badda looked at:

1. What informants described or reported in their interviews concerning SOI (described in this section); and
2. The outcomes of information sources in terms of historical awareness and informants' reliance on the city's flood protection (described in next section).

5.3.1 Reported SOI from Informants' interviews

Both verbal persuasion and observational learning information sources were identified in the interviews with informants.

Verbal Persuasion sources

Community interactions

Three main categories of community interactions were identified from informants' interviews (Table 5.2):

- 'Part of communities';
- 'Personally give info.';
- 'Mother to child'.

The 'part of communities' category (Table 5.2) involved the networks and connections informants had with their local communities. The close relationships that informants have with their neighbours and communities, provides them with a strong local source of social capital (Box 5.4), which in turn acts as a source of information on local events and emergencies. Informants exhibited confident assurance that even if they didn't get the message from other sources (e.g. TV or radio), they would be informed by a member of their community - *"Yes, I supposed if I didn't see the news someone else will tell me that 'Mitu's mum this might happen so please beware'.*" (PB8). The 'neighbour' is someone that is identified as being a potential source of information, as are older people who are seen as people who 'might' know - "*Ask my neighbours, or people who might know, people who are older than me I ask them as well*."(PB3).

Table 5.2 Sources of community interactions, the role these sources of information. The final column presents the Author's impressions of the characteristics of flooding in community interactions.

Community Interaction	Role of Info sources	Author's impressions of the characteristics of community interactions
Part of communities: • "*We keep up with the different communities."* (PB2); • " *Ask my neighbours, or people who might know, people who are older than me I ask them as well*."(PB3); • *"Yes, I supposed if I didn't see the news someone else will tell me that 'Mitu's mum this might happen so please beware'.*" (PB8); • "*We get signals from TV, radio and each other. We can prepare according to that*." (PB8). **Personally give info:** • "*I prepare myself. It seems sometimes a lot of people doesn't know what I know. I tell others what to do.*" (PB5). **Mother to child:** • "*They were little kids, they*	**Help**: • "*I ask my neighbours, or people who might know, people who are older than me I ask them as well...I ask for help from them.*" (PB3) **Warning**: • "*Yes, I supposed if I didn't see a news someone else will tell me that 'Mitu's mum this might happen so please beware'.*" (PB8). **Coping strategies:** • "*I also told them that don't walk in the water. Because the roads can have holes and you won't be able to see that through the water. Those holes can have broken glasses in them. If you step into those holes we might have to amputate your legs or you might even die.*" (PB1); • "*What I do my children can see and they learn that way*." (PB8);	• Current, Now; • Urgent; • Intimate; • Cultural; • Coping mechanism; • Trusted; • Relied on.

Community Interaction	Role of Info sources	Author's impressions of the characteristics of community interactions
didn't understand a lot of things. They used to run down and splash about in the water. The water was really dirty. I used to tell them then that it is not good to splash about in there because you will get boils and rashes." (PB1); • "*Yes, during the monsoon I don't allow them to walk in the dirty water because it would cause them to have boils and skin diseases. I make them drink boiled water to prevent diseases, I don't allow them to play with the muddy water*." (PB3); • "*Mother told me to not allow the children to play in the water. Not to get in the water, tidy things up together so that they don't get lost, keep everything tidy…*" (PB5); • "*My parents used to tell us when the water level was high, that do not go in the water… they helped us walk properly using the shakos* [bamboo bridges], *we do the same things. We take them to school, bring them back safely, we make them have good food, we keep tablets and water at home. Because we never know what might happen…*" (PB7); • "*No, I taught my children: stay away from water, don't drink the water, don't play in the water…*" (PB10).	• "*She* [her mother] *used to say don't go into the dirty water…*"(PB9).	

The second category ('personally give info.) involved the view that the informant themselves was a source of information to their communities. Although three informants mentioned being involved in getting aid for community members during floods, only one specifically commented on the information she shares with her community - "*I prepare myself. It seems sometimes a lot of people*

doesn't know what I know. I tell others what to do. Not to let the children get in the water, to keep the things tidy. I help the new people; tell the people who can't swim not to get on the boats. I do as much I can to help." (PB5).

The last category ('Mother to child') identified the important role mothers[47] play in passing on their knowledge and information concerning staying safe and healthy during floods (Table 5.2). Informants were asked to describe what they teach their children regarding flood safety, this question was left open to see what informants placed emphases on in their descriptions; Table 5.2 lists some of their responses. All informants were able to quickly point out the different things they warn their children against doing during a flood. For the most part these warnings involved staying away from dirty water, and awareness about the dangers of walking on *shakos*[48] (Figure C.14), or in flooded streets where potholes cannot be seen. No informant described how they might teach their children to prepare for a flood (e.g. how to use bamboos to lift house or furniture, how to build macha - bamboo platforms), however, one informant suggested that these things were learnt through watching and doing, more than explanation - "*What I do my children can see and they learn that way*." (PB8).

Community interaction plays the role of providing information that helps, warns and enables coping (Table 5.2). This information is often received or given during flood events so it's current and, although what is being shared may have been learnt from experience in previous floods, its application is considered to be relevant to a present event not just historically. Nor is the information sought in regards to a historical interest, but in an interest of getting through the next or current event. Because of this the information often has an urgency associated with it, especially if it involves warning or the search for help. Given that sources identified can be considered as close to the informants, be it mother or neighbour the collective culture of the communities makes them all one in the eyes of the informants (Box 5.4), as such these SOIs and the information they

[47] As no fathers were interviewed, it is impossible to comment on their interaction with their children.
[48] Type of bamboo bridge, see Appendix C, Section C.5 for description and photos (Figure C.14).

give is intimate and relied on (trusted). Very often the information itself is part of the coping strategies informants have to cope with floods.

Organisational interactions

Only two categories of organisational interaction were identified: 'with NGOS' and 'local schools' (Table 5.3). 'With NGOs' involved the work Food for the Hungry (FH) has done in developing the local community-based organisation Sochesta. Informant PB1[49] played an active role in this work, and so brought it up often in her interview. Interaction with NGOs usually involved the receiving of aid, however, informant PB1 did mention that they received information on how to prepare from FH, and that they had a guide on what people need to survive a flood - "*Yes, We have it* ['survival' guide] *in our office. In our Banani head office… Mizan gave us from there…*" (PB1).

Not much was said about what local schools taught local children regarding coping responses. One informant (PB2) taught at a local school, and it was she who described giving her students advice on what they should be careful of during a flood (Table 5.3).

Table 5.3 Sources of organisational interactions, the role these sources of information. The final column presents the Author's impressions of the characteristics of flooding in organisational interactions.

Organisational Interaction	Role of Info sources	Author's impressions of the characteristics of organisational interactions
With NGOs: • "*Then I spoke to Mizan and the others stood in the roads somewhere. I told him what supplies we needed.*" (PB1); • "*Yes, We have it* ['survival' guide] *in our office. In our Banani head office… Mizan gave us from there…*" (PB1). **Local School:** • "*I give my students this advice. I tell them to safe as much water as they can...Because they can be attacked by Diarrhea or Cholera or Jaundice. They*	• Help; • Preparedness needs; • Awareness.	• Limited; • Not diverse; • Restricted (not available to all); • Caution; • Unable to rely on.

[49] It should be noted that it was informant PB1 who acted in introducing us to other informants, and as such all informants are believed to have some attachment to the community-based organisation Sochesta, established with Food for the Hungry support.

Organisational Interaction	Role of Info sources	Author's impressions of the characteristics of organisational interactions
can take bath in pure [Clean] water. They shouldn't get out of their house because they can fall into the flood water and die in that way...I tell the children to drink clean water." (PB2).		

The role of information received through organisational interaction is to primarily provide or get help during flood events, it also plays a role in teaching residents what they need to survive and prepare for floods (Table 5.3). Because this type of interaction does not appear to be prominent in informants' interviews, organisational interactions are seen as limited in what information they provide informants. In a similar regard they do not appear to be a diverse information source, nor do they appear to be equally available to all. Those who have participated in FH's project received training, education (e.g. reading, writing and basic maths) and skills (e.g. budget development & management, business know how), these people act as representatives for the community, so in effect what begins out as organisational interaction ultimately relies on community interaction to propagate the information. What this could mean is that the space for information from the outside in these communities is small, and most residents are passing on and relying on their own experiential knowledge and awareness. It may be that there is a degree of caution connected with organisational information, and less of a perception of it being reliable.

Media messages

Media sources identified as providing informants with flood-related information include: television, radio and newspapers (Table 5.4). These information sources play an important role in warning informants on weather and flood events. Informants described getting updates on storms and water levels - "*Yes* [from the radio or TV] *sometimes we do get news. Sometimes they* [unspecified] *tell here, that the water level is this high…*"(PB5). These updates are important in giving them cues as to when to prepare, what to prepare, what responses are needed or should be done (e.g. evacuate or stay).

Media messages are supportive and informative, they give informants guidance as to how to respond and when (before and during a flood) to respond. Although not seemingly diverse, informants did appear to consider these sources important, and indicated some degree of reliance on them.

Table 5.4 Sources of media messages and the role of these sources of information to informants. The final column presents the Author's impressions of the characteristics of flooding in media messages.

Media sources	Role of Info sources	Author's impressions of the characteristics of media messages
Television & radio: • "*We can hear things on the news that water level here is high… We watch it on the television*." (PB1); • "*We get signals from TV, radio and each other. We can prepare according to that*." (PB8). **Newspapers:** • "*We see the news, read the newspapers*" (PB2).	• Warnings; • Storm updates; • Updates on water levels in rivers: ○ "*Yes* [from the radio or TV] *sometimes we do get news. Sometimes they [unspecified] tell here, that the water level is this high…*"(PB5).	• Supportive; • Informative; • Guidance point [for responses].

5.3.2 Observational learning sources

In Badda, no memoria were found nor described by informants; flood history is kept in their living memories so need to construct memorials does not appear to be deemed necessary[50]. In addition to memoria, no indirect experience was identifiable in informants' interview responses. Informants' prior experience, discussed in Section 5.2, although classified as an intrapersonal variable (Rogers, 1983), appears to be a significant learning source as well.

Environmental clues

Table 5.5 shows the four categories of environmental clues identified from informants' interviews. These categories include:

- 'Weather signs';
- 'Water dynamics';
- 'Situation upstream'; and

[50] Despite not finding any memorials, it may be that such memorials do exist and are situated in other parts of the city, however, none were found during this study's fieldwork, nor were any described or spoken of by people talked to by the author.

- ‘Animal behaviour’.

The monsoons are part of the annual cycle and the heavy rains they bring are often the source of major floods. However, in Dhaka (like many urban environments) not all floods are fluvial, the poor drainage systems mean that heavy rain can quickly lead to pluvial and urban flooding, this can be widespread or localised to more vulnerable areas. Whatever the cause, informants know that rain will lead to flooding of some kind or another, and have a high regard for information weather signs can give. Dark skies, wind, and clouds all are harbingers of a storm brewing and a warning to informants to prepare be it for flooding or other consequences of the torrential showers of the Monsoon (Table 5.5). Observing a raise in water levels in nearby water systems, was described by a informant as providing a cue for starting to prepare for an approaching flood - “*When we can see that the water is rising we start to prepare. Normally 10-15 days before the monsoon season.*” (PB4). Another informant pointed out that knowing that it is flooding upstream at Sylhet, is a good indication that they can expect some flooding downstream in Badda (Table 5.5). This same informant also mentioned how ants get wings and fly to somewhere else when it floods - “*But when it floods the ants they move somewhere else. It seems like they get wings…*” (PB2).

Environmental clues play the role of warning and indicating how informants should manage the situation in terms of preparing and responding (Table 5.5). These signs have the ability to generate fear - “*At that time everyone feels scared, a storm is coming, rain is coming.*” (PB3) - and create a sense of urgency. Environmental clues are also informative and good sources of guidance to informants.

Table 5.5 Environmental clues and the role of these sources of information to informants. The final column presents the Author's impressions of the characteristics of flooding in environmental clues.

Environmental clues	Role of Info Source	Author's impressions of the characteristics of environmental clues
Weather signs: • "*when the water is about to come you can just tell by the signs… The sky becomes dark…The sky looks dark and it rains a lot… Rain is always there… Then the water level slowly rises…*" (PB1); • "*When there is a storm brewing we can hear the sirens of the wind, there is electricity failure at that time.*" (PB3); • "*Yes we can see, the sky becomes cloudy, the sky doesn't look good, it looks dark. It is like two days before it starts to rain...There are flashes of lightning, and you can hear the thunder."* (PB4); • "*When flood comes sky gets very cloudy.*" (PB8); **Water dynamics:** • "*When I can see that the water is near my house…I can see the flow of the water… How it is moving… there are times when it's fairly slow…Suppose the water level increased by this much… when it floods and the weather is likely to cause a flood then the water level increases by that much in one night… We definitely understand then…*" (PB1); • "*When we can see that the water is rising we start to prepare. Normally 10-15 days before the monsoon season."* (PB4); **Situation upstream:** • "*We can understand in that way. When it rains outside of Dhaka like in Sylhet we can tell that the water will go down through Dhaka*." (PB2); **Animal behaviour:** • "*In Dhaka we don't have many*	**Warning**: • "*When a storm comes, the sky becomes darker in colour, the wind flows, you can tell it from the winds…There are lightning flashes in the sky, from that it can be understood that rain is coming.*" (PB3); • "*At that time everyone feels scared, a storm is coming, rain is coming.*" (PB3). **Management** [choice of action] **point**: • "*When the flow of water is too strong and the sky is making all kinds of sounds… you can hear the thunder and see the lightning… we do something at that moment… because we have been in that rut before… we understand that this time the water level will be high…*" (PB1); • "*When it rained I understood that water will come in our house. I used to put bricks in front of our house so that water may not pass*." (PB8); • "*If I see clouds in the sky I don't go out because we might get stuck in the place where we are supposed to go if a flood started.*" (PB8).	• Urgent (fear generating); • Informative; • Guidance point [for responses].

Environmental clues	Role of Info Source	Author's impressions of the characteristics of environmental clues
cows. But when it floods the ants they move somewhere else. It seems like they get wings…" (PB2).		

Cultural sources of learning and information

Observations made by the author revealed aspects of a cultural meaning system relating to floods. Table 5.6 lists the symbols observed during fieldwork in Dhaka that related in some way to the selected symbols of 'Flood' and 'Flood defence' in informants' environment.

In general the author was surprised that not more symbols[51] were evident in the physical environment of Badda. She did observe the presence of bridges made of wood, corrugated iron, or bricks/stones (stepping stones) used to get past wet areas. In regards to this observation a specific example was the water logging around the home of one informant (Figure 5.5).

Table 5.6 Meaning systems identified through observations in Dhaka.

Meaning system name:	Flood	Flood defence
Meaning system description:	Events, symbols, language (were accessible to interviewer) and things in the physical environment which have an associated meaning to 'flooding - be it present threat or past remembrance - as can be identified by the researcher.	Events, symbols, language (were accessible to interviewer) and things in the physical environment which have an associated meaning to 'flood defence' - be it present threat or past remembrance - as can be identified by the researcher.
Daily Experience	• Little to indicate the risk of floods in environment. • Bridges (walkways) built over wet area (water logging); • Water logging around home (Figure 5.5).	• Embankments that are also roads; • Items that are all used in flood defence but outside of the flood season hold other purposes (Figure 5.8): o Bricks; o Bamboo. • Slum houses built on stilts (Figure 5.7). • Sand sack walls to protect home from water logging (Figure 5.8). • Belongings kept on high selves around

[51] Cultural meaning systems that hold a flood meaning to local residents.

Meaning system name:	Flood	Flood defence
		house (Figure 5.9).
Historical legacy (place memory)	• One flood mark along the bottom of a building (Figure 5.6). • Flood marks pointed out by informants in their homes.	• Nothing observed

(Source: Birkholz, visit to Dhaka City, 2012)

Figure 5.5 Water logging around '*katcha*' house.

Only one flood mark could be found on the base of a house near Gulshan Lake (Figure 5.6). The lack of flood marks was an interesting observation; in many ways it appeared to the author that outside of monsoons flood legacy is not actively reflected in the physical environment of Dhaka. Although largely invisible within the physical environment, discussions with informants reveals that Dhaka's flood legacy is present in the memory of residents. Informants were able to point out flood marks within their homes, marks that they live with on a daily basis, but that are not evident to passer-bys.

(Source: Birkholz, visit to Dhaka City, 2012)

Figure 5.6 Only flood mark found during field visit to Dhaka City. Red circle shows the old flood mark around the base of the building.

Symbols that spoke of flood defence and the need to be prepared to defend against flooding were a little more evident than symbols that spoke to flood legacy (Table 5.6). Several houses observed in slums are built on bamboo stilts as seen in Figure 5.7. During visits to different homes in Badda, informants pointed out to the author artifacts that carry a flood defence function. Such artifacts include bamboo and bricks, these appear to have two annual functions, during the flood season they would be used to help lift a house or belongings, but in the non-flood seasons they could be used for other purposes. At one informant's home she was shown where the informant stored their bamboo and bricks in preparations (Figure 5.8). This same informant also was using a small wall of sand sacks to help keep water logging from getting into their house (Figure 5.8). While visiting another informant, the author was

shown how they stored their belonging on high shelves to help protect them from flooding[52] (Figure 5.9).

(Source: Birkholz, visit to Dhaka City, 2012)

Figure 5.7 Houses on slits in slum near Rampura Khal.

Given that the author did not come during a flood season, the lack of symbols relating to flooding and flood defence could be explained. To the author this suggested that these symbols are entrenched within the cultural meanings and understandings around flooding these communities have. To truly understand and indeed identify these meanings and understandings would require more extensive research than time available allowed for the author to carry out. However, that a culture of flooding exists in the lives of urban-poor communities in Badda is evident in some of what was observed. Things carry an innate flood meaning in terms of their uses during floods, and alternative meanings in how they are used outside of floods. This transferability of meaning and function is observable in the use of bamboo and embankments that also act as roads, and

[52] Although described as a flood defence, it is recognized that storing belongings on shelves is not restricted to a flood defence function, but represents a commonly used method to store such objects – even in communities that have no flood risk.

means that outside of flood seasons there will be an invisibility of the flood legacy and threat to outsiders who do not hold this cultural understanding. These aspects are not strictly ‘memoria’, but more of a cultural source of learning and information present in Badda.

(Source: Birkholz, visit to Dhaka City, 2012)

Figure 5.8 Flood defence items bamboo (left), bricks (bottom right) and sand sacks protecting against water logging (top right).

(Source: Birkholz, visit to Dhaka City, 2012)

Figure 5.9 Belongings stored on high shelves to help protect them from floods and water logging.

5.4 Outcomes of SOI in Badda

This section looks at the outcomes of the SOI in terms of historical awareness and reliance on public protection[53].

5.4.1 Informants' knowledge of the flood history and events of Badda

In Badda historical awareness is very much a product of life-lived, all informants have personally experienced most of the major flood events that have occurred in the last three decades (1988, 1998, 2004 & 2007). What's more they experience the smaller incidents of flooding due to pluvial and urban sources on a month-by-month basis. Due to the experiential source of their knowledge and awareness of historical floods, flood history in Badda was not discussed relative to individual questions it was made reference to throughout informants' interviews. Discussed in this section is the second theme identified under 'prior experience' (Section 5.2.2), 'events'. 'Events' were restricted to those that occurred during major floods, not annual 'normal' floods. Exploration of this theme focused on the thematic analysis, and did not make use of basic domain analysis[54]. Two sub-themes emerged from informants' experiential knowledge of the major floods:

1. Their knowledge of the events themselves included:
    a. Awareness of hydrological and temporal dynamics of the different floods (depth, duration);
    b. How they themselves responded or what they were forced to do to cope;

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[53] Coping responses could also be considered an outcome of information, however, as they are ultimately the outcomes or result of informants' cognitive appraisal processes and protection motivation they are discussed in their own Section (5.6).

[54] Although the categories identified during analysis of informants' flood experience do reveal some of the semantic relationships informants hold in regards to flooding. Relationships identifiable within flood experience are: 'impacts on' ('results in'); 'handled like/with/by' (coping responses, Section 5.6); 'happened when' (Table 5.7). However, far more time in the field and during analysis is required to handle meaning establishment around these than was available to the author in this study. However, future research into how floods and their defences impart meaning in Dhaka residents' life is a recommended study to better understand flood [or disaster] culture in high frequency [in terms of hazardous events] urban environments.

c. The emotive impacts (and imprints) they experienced;
d. The significance of the flood in the social memory of Badda; and

2. Informants' understanding and characterisation of what makes a bad flood.

Informants' knowledge of historical events

When describing the major flood events, three main categories were identified:

- 'Community social memory' (involving points recalled by informants that appear to describe the floods in general or from a more broad community perspective);
- 'Personal experience of floods' (involving both informants' personal experiences during the floods and the emotions they recall or associate with them);
- 'Flood dynamics' (involving the duration of the flood and water depth experienced by informants).

Table 5.7 shows these categories, their sub-categories and the descriptors identified from informants' interview responses regarding the different flood events (year).

Each major flood event experienced and survived appears to become imprinted on the social memory of the informants and their communities. They act as significant markers in the lives of informants, points of recall and association with historical events that can carry emotional (affect) heuristics as well as cognitive. The category of 'community (social memory)' is made up of descriptors identified from informants' responses that represent 'general events' informants associate with the different floods. For the 1988 flood, points that stood out included: the departure of families from the area; that every house was flooded; and that this flood affected the whole country. For the 1998 flood informants recall how their area had the most casualties, so much so that dead bodies were seen floating, that again water got inside homes, and that there were many problems with food, medicines and communications. The 2004 and 2007 floods had a less dramatic impact on local communities, as represented by the least amount of 'general event' descriptors. The 2004 flood was marked by water getting into homes, but was not recalled for the 2007 flood. Only one

informant really discussed the 2007 flood, again indicating that it was not as drastic (to informants) as the others.

Sub-categories relating to the 'personal experience of the floods', included: 'personal events' and 'emotive descriptions' (Table 5.7). Personal events were characterised by informants' descriptions of what they had to do during the different floods to cope. The floods of 1988 and 1998 both included descriptions of having to evacuate and leave home and belongings, or alternatively having to live on *macha* or roofs with belongings to avoid the flood. In 1988 informants mentioned not getting aid, however, in 1998 some aid was received from NGOs, foreigners and the army. No informant mentioned having to evacuate during the 2004 and 2007 floods. An informant did mention that she had to raise her furniture and that she had to miss work because of the 2007 flood (because they couldn't leave their homes). Informants remember getting sick, having to borrow money and live on *macha* during the 2004 flood.

Emotive descriptions provide indication of the emotions (affective) informants have associated with each flood (Table 5.7). In general all informants recall having to struggle to get by, many describing their experiences as 'suffering'. Which flood was recalled as the worst varied with informants and their experiences of the floods (i.e. where they were during the floods, or how old they were, or what their status was e.g. father or husband able to work and bring in an income). The flood of 1988 is recalled with a greater appreciation of the fear that people had during it, one informant went as far as saying - "*people died out of fear*" (PB10).

The last category involves the flood dynamics of the different floods, with informants able to recall the depths the floodwaters reached, and how long the floods lasted (Table 5.7). Although, informants couldn't always give exact figures regarding water levels, they were able to indicate its height through flood marks on their walls or pointing to where it came in their or their neighbours' houses - "*ground flood entirely covered*" (PB2), '*lived on roof*' (PB3, 4 & 7), "*above neighbours' roofs*" (PB5).

Table 5.7 Descriptors of informants' experiences relative to the different flood events (years).

Categories	Sub-categories	1988	1998	2004	2007
Community (social memory)	General events	• Many families left (PB9); • Every house was flooded (PB9); • Whole country was flooded (PB10).	• Area had most casualties (PB4); • Water inside homes (PB9); • Dead bodies floating (PB10); • Food, medicines, communication problems (PB10).	• Water got inside homes (PB9,10).	
Personal experience of flood	Personal events	• Lived on streets with belongings (PB6); • No one helped us (PB6); • Small didn't understand (PB7);	• Lived in school (PB1); • Lived on macha and roof (PB3, 4, 7); • Received aid from NGOs, foreigners & the army (PB4, 2, 5); • Went to village (PB8).	• Received aid from NGOs & foreigners (PB4); • Had to miss work (PB5) • Raised house & lived on macha (PB6,8); • Got sick going into water (PB8); • Borrowed money (PB8)	• Couldn't get out of house (PB2); • Son 6 months (PB2); • Used bamboos to lift furniture & as bridges (PB2).
	Emotive descriptions	• Scared (PB6, 10); • I remember that flood the most (PB9); • People died out of fear (PB10); • We struggled a lot (PB10).	• Worst flood ever (PB3); • Struggled (PB3,7); • Suffered (PB7);	• Major flood (PB1,8); • Everything went under water (PB5); • Suffered (PB7); • Struggled (PB10).	
Flood dynamics	Duration	• 3-4 months for water to go down (PB6); • 2 months in shelter (local shops) (PB9); • 3 months (PB10).	• 3 months water to recede (PB1); • 6 months water remains (PB3).	• 4.5 months water to recede (PB5); • 3-4 month duration of flood (PB9).	• 3 months (PB2).
	Depth	• Houses inundated (PB6, 9, 10)	• 30 feet (9m) in some areas (PB2);	• 5-6 feet (PB2); • Lower than 1998 (PB3);	• 4-5 feet in roads (PB2); • Water didn't get into

Categories	Sub-categories	1988	1998	2004	2007
			• 6 feet in home (PB2); • Ground floor(s) entirely covered (PB2); • Raised house (PB6); • Lived on roof (PB3,4,7); • Houses inundated (PB1,2,3,4,7,8,9,10)	• Lived on roof (PB4,5); • Chest height at peek, waist height on average (in house) (PB5); • Above neighbours' roofs (PB5).	house (PB2).

Informants' descriptions of the characteristics of a 'bad flood'

The experience informants have had of the different events, have enabled informants to discern the 'bad floods' from the 'not-so-bad'. Table 5.8 shows the characteristics informants associated with 'bad floods', these characteristics were identified as being connected to the:

- 'Nature of the flood [waters]';
- The impact the flood had on the health and wellbeing of the informant and their families; and
- The impact the flood had to their property and belongings.

Characteristics related to the 'nature of the flood [waters]' included things such as (Table 5.8):

- The flood water rising too fast to give informants time to prepare;
- The water getting into their homes;
- The height of the water;
- Having to leave their homes because of the water;
- The flood waters limiting their ability to undertake daily tasks and look after their families;
- The flood waters limiting their ability to get help;
- The length of time the floodwaters stayed for, and what the flood waters left after they receded;
- Flooding coupled with heavy rain.

These characteristics in general describe how the flood dynamics influenced informants' ability to cope (e.g. time to prepare) or what they had to experience (e.g. moving out of home, stress of not being able to look after family) because of it.

Table 5.8 Characteristics of a 'Bad flood' as put forward by informants, based on their prior experience.

Category	Characteristics	Supporting excerpts
Nature of flood [waters]	Floodwater rises at fast rate, not giving informants time to act or prepare.	• "*With the rain and everything water level rises two or three feet more… We don't see any way out at that time. We even don't get time to raise our furniture at that moment, because water comes really fast…"* (PB1).
	Floodwater enters their house/home.	• *"Yes… when it flooded during the 2004 flood… We had many difficulties… because water got inside our house…"* (PB9). • "W*hen the water comes inside the house the situation becomes dire…very troublesome*" (PB9).
	Height of floodwater.	• "[Why do u remember 2004 flood] *Because water level was really high…it was up till here* [chest]…*when the water level went down a bit… inside the house* [waist]." (PB5).
	Forces informants to move out of their homes.	• "The worse day was then [1998], *when we had to leave our house as the water level was just too high...That was the most painful experience…*" (PB1). • "*We lived on the roof, we got soap and flat rice from people*." (PB4).
	Limits their ability to undertake daily tasks or look after family.	• *"Because I cannot get out of the house"* (PB2). • *"1998, Was the worst flood ever, water level was up till this point of our house, It was really hard for us to cook and eat."* (PB3). • "*Yes, we suffered a lot before… when the water level got raised it stayed there for 1 week and 15 days… At that time it was hard for us to get drinking water or water to take a bath… when it was like this last time I was expecting my youngest son…*[1998]" (PB7).
	Limits their access to help.	• *"When the flood is not that high, we have some ways to survive… We can tell someone that we are dying here, so they help us… But if it floods everywhere then we don't get any help… Suppose if you had a high raised building… then you can see people suffering and you can offer them help… But if everyone is facing problems… then they are busy with themselves… and don't have time for others…"* (PB7).
	Floodwater is slow to recede (duration).	• *"About 2 months, if the flood is severe water stays for about 2 or 2.5 months...If it's worse than that the water remains for 6 months… in 1998's flood it stayed for 6 months"* (PB3). • *"Sometimes water level rises a bit but it generally goes away in 1 or 2 days but during heavy flooding water stayed here for 1 month to 4 months."* (PB4). • "[why do u remember 2004 flood]*… It stayed for 15-20 days… then it gradually decreased, but that took about 4 1/2 months…*" (PB5).
	Floodwater is slow to recede, and as it does it creates further issues for	• *"It's more difficult for us when the water level doesn't recede rather than when the water level rises...There are rotting animals such as rats… they have bad odour. Flies everywhere…We had to struggle a lot. We had mud all over our feet. Our feet were filled with boils. We couldn't sleep at*

	informants and their recovery.	*nights because of the pain… the kids…"* (PB1). • *"We have problems… Our belongings gets spoiled, the children gets skin diseases, fever, diarrhea and many other things… To get over all these things it takes about 11/2 years…"* (PB5). • *"There were more problems at that time [after the flood]. When the water level goes down we get a lot of rubbish in our house. When everything dries up there are more germs to deal with. People get sick more often in different houses. Diseases like diarrhea are there all the time. When we get wet in the water we get an after effect from it. We get diseases later."* (PB8). • *"Yes, the water was there for one month… water level kept rising for a month… then it took a month for the water to recede. Then to clean everything up with detergent and bleaching powder it took about a month…* [In 2004]" (PB9). • "*A long time. 6-7 months…To recover from the flood, to heal the children, there are diseases when the water goes away, diarrhea, jaundice, there is rubbish everywhere, it takes long time for the stench to go away…*" (PB10).
	There is flooding and heavy rainfall.	• *"During that time there was the flood and also there was heavy rainfall…We couldn't get out of our house, we were stuck inside our houses [*1988]." (PB6). • "*But the other type of flooding that comes from the rivers and on top of that if it rains the flow of the water increases… by a lot.* " PB1.
Impact on well-being & health (self & family).	Husband unable to work.	• *"My husband didn't have any work at that time… we were provided flat rice and sugar lumps at our house… we ate those…*[1988]" (PB10).
	Children.	• *"There is no longer the opportunity to drink water from tube well, the children find it problematic to go the bathroom since the sewage floats on water, it's not possible to walk on the roads, the children eat their food with disgust, diseases occur, it becomes difficult to cook, it's becomes difficult to feed the children on time, it's harder to move about."* (PB3).
	Frightened, worry, stress.	• *"Yes, they are different, when it floods more it's very frightening, when it floods less it is less frightening…"* (PB5). • *"The scariest one was 1988…People were very needy in that flood* [1988]. *Many people had never seen a flood before. It was sudden… so people were panicking…They didn't know what to do, where to go… people died out of fear…"* (PB10).
Impact on property & belongings	Abandon belongings & home.	• *"We just couldn't stay there anymore. We left all our belongings and took a few pillows and plates then we left. We just took a few of those… and left most of them behind.* [1998]" (PB1). • *"We took it* [their belongings] *in that three-story building during 1991 and on the streets during 88… We couldn't take everything. We took whatever we could, rest we put above the roof on a macha."* (PB6).
	Damage.	• *"The normal ones* [floods] *doesn't do that much damage… The big one's does more damage…"* (PB9).

The impacts of a bad flood have been explored within Section 5.2 in connection with informants' prior experience. Bad floods are also characterised by the emotional stress and fear they cause to informants (Table 5.8). It appears from informant's responses that damage with floods goes hand in hand and is to be expected, however, bad floods are seen as those that do "*more damage*" (PB9) than "*the normal one…*" (PB9).

5.4.2 Reliance on public protection

In general, informants were not identified as having any clear reliance on public protection. They did indicate that they had received aid from different organisations during the major floods (Box 5.5); however, the distributing parties, local chairmen (community leaders) and/or government officers often stole the aid. The aid that was received was never sufficient to feed their families. One informant suggested that the government really only helped when they wanted to win the elections - **"***Who would come up to help us? Chairman and his members, the politicians who want to win the elections they are the ones who help us...They give us flour, puffed rice and flat rice*" (PB3). Another informant did recognise that it was impossible for the government to help all the affected people and because of this people had to be able to look after themselves, they couldn't rely on the government for aid - "*Government cannot help 140000000 people… people needs to step up…There are many people who would die but never ask for help… What if we did ask for help and they rejected us right on our face? What then? We would be deeply ashamed and we wouldn't have anything solved either…*" (PB10).

Box 5.5 Excerpts indicating informants' perceptions of authorities' aid during floods and its reliability.

- **"***Who would come up to help us? Chairman and his members, the politicians who want to win the elections they are the ones who help us...They give us flour, puffed rice and flat rice*" (PB3);
- "*We didn't have any outside help. We had to work ourselves. The relief sent by government were taken by the chairmans and other government officers… They gave us something twice… like 5 KGs of rice…*" (PB5);
- "*Government cannot help 140000000 people… people needs to step up…There are many people who would die but never ask for help… What if we did ask for help and they rejected us right on our face? What then? We would be deeply ashamed and we wouldn't have anything solved either…*" (PB10);
- "*We struggle a bit in Dhaka. But we can go to higher places in Dhaka. In Dhaka we can get shelter in local schools… people some times leave their houses to provide space for flood victims… In the villages they don't provide much room in schools… the distributing parties steal all the stuff before the things come to us… we get one KG of falt rice and 250 G of sugar lumps every month… for a family of 7… It's not enough. So we suffer a lot. We have snakes in the villages. The children can't sleep at night… we sit with our children and not sleep…. Because we are so frightened…*" (PB10).

Perhaps because of their inability to rely on the government for protection and relief, informants demonstrated recognition for the need to be self-reliant (Box 5.6). Within this recognition was some informants' awareness of the need to be of service to their communities, and being able to help largely gave them a sense of pride. Awareness that the aid that is supplied is taken by local officials and distributing parties, further equips informants with the knowledge that they have to look after themselves. Interestingly these informants demonstrate a high resilience in the face of the hardships they experience during major floods. The fact that they recognise that they have to look after themselves because no one else will (Box 5.6) appears to drive them to find ways of getting through, which potentially is why they have developed the coping strategies they have (Section 5.6).

Box 5.6 Excerpts indicating informants' recognition of the need to be self-reliant.

Help others:

- "*I helped my slum. I made them get reliefs from three different NGOs… There was about 371 houses in the slum…I helped them get rice, lentils and salt from those NGOs… One of their offices is in Malibag." (PB1);*
- *"I prepare myself. It seems sometimes a lot of people don't know what I know. I tell others what to do. Not to let the children get in the water, to keep the things tidy. I help the new people; tell the people who can't swim not to get on the boats. I do as much I can to help. If they don't have food when I cook I give them something. If they don't have money I try to help with money…*" (PB5);
- "*I felt really good at that time. We went on field duty. To see how people are doing. Then we had a meeting to find out what can we give them. Like medicine, saline, water purification tablets, soap. Before that we gave them rice and lentils also. We had to struggle a lot to distribute the relief but it was worth it. We went together and served. It felt great.*" (PB8).

Outside help taken by others:

- "*We didn't have any outside help. We had to work ourselves. The relief sent by government were taken by the chairmans and other government officers… They gave us something twice… like 5 KGs of rice…*" (PB5);
- "*the distributing parties steal all the stuff before the things come to us…*" (PB10).

Who else?:

- "*Yes, we took care of ourselves…*" (PB6);
- "*We have to do things… because it's my life… I have to solve my own problems… No one else would do it for me… We have to face the problems on our own… When I'm hungry I will have to cook or get the food… Or else I would remain hungry… I had to struggle to get the food…but I had to get it for my little children… My husband used to go to get the food by boat… It wasn't possible everyday… Sometimes we didn't eat for a day or two…We couldn't even change clothes frequently… we had to wear the wet clothes…* " (PB7);
- "*You guys* [interviewers] *don't face problems like we do. If you guys faced problems every minute, every hour and every day then you would change too… When someone starts to drown in the water they have to learn how to swim on the spot to survive…*" (PB7);
- "*I have to look after my own children… who will depend on who… We can go to our relatives house… but we can't stay there for too long… everyone is in distress at that time… How many days can we depend on someone else? May be two or three days… we can disturb someone. Then we feel guilty ourselves… So we try to live in our house even though it is difficult… When we can't take it anymore we move to our relatives' house… but we try to be on our own as long as we can… we are our own responsibility…*" (PB9).

5.5 Cognitive appraisal processes

5.5.1 Threat Appraisal

Analysis of threat appraisal looked at:

- The 'perception of flooding as a threat' (inclusive of emotion/fear);
- The 'perceived need to prepare'.

Perception of flooding as a threat

In exploring informants' appraisal of flooding as a threat, a metaphysical question was included in the interviews. This question asked informants to talk about their worst flood experiences, and then identify which flood event they

experienced as being the 'worst' for them (reply most often came as a year - 1988, 1998, 2004 or 2007). Based on their responses, informants were then asked 'what type of person they thought that year (of worst flood event) would be'. Figure 5.10 shows the code plot that was developed from analysis of informants' response to this question.

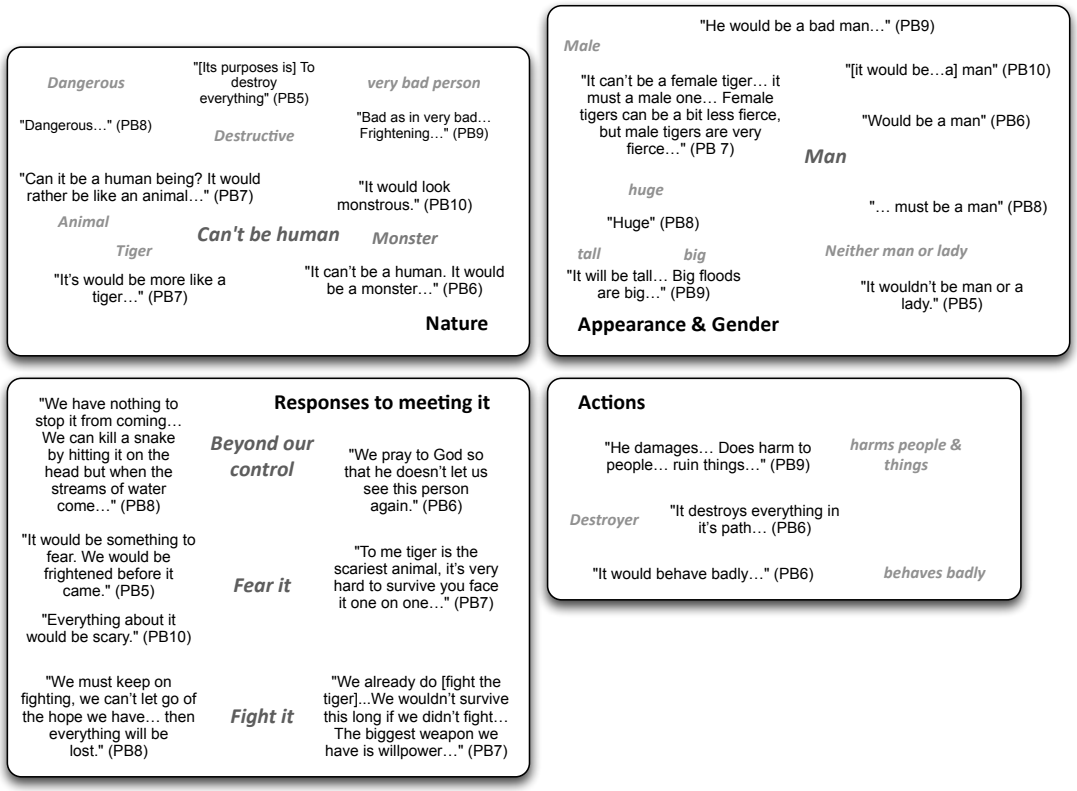

Figure 5.10 Code plot of informants' responses to the question 'What type of person would their worst flood be'. Boxes represent responses to different aspects used to elicit response; size of box roughly represents emphasis informants gave to each aspect. Words in dark grey (larger font) represent response categories identified, and light grey (smaller font) words codes related to each response.

As can be seen informants see floods in a negative light. They can't perceive the flood as a human as it represents something to them that surpasses their comprehension of what a person would be capable of. Instead they see floods as monsters, or animals (tiger), things that they perceive as having dangerous, destructive and [very] bad natures (Figure 5.10). Although they, for the most part can't perceive a flood as a human ("*It can't be a human…*" PB6), they did see it as being male as opposed to female. One possible explanation to why these informants see floods as male may be that to these women men

represent the strength in a household and act as the head of the household. They live within a culture that promotes submission of women. Furthermore, it is well documented that women living in such contexts are also exposed to abuse from their men (Rashid, 2000), and if not them, they live in such close confines and communities that they are aware of it happening to their neighbours and friends. It could be these experiences that are influencing their perception of men, and resulting in them associating something they see as being destructive and harmful as being male. The informant that perceived the flood as a tiger, did so because she saw the tiger as the scariest of animals -"*To me tiger is the scariest animal, it's very hard to survive you face it one on one…*" (PB7), this provides further justification to this assessment of informants' views on the masculinity of a flood being associated with views on the fierceness and strength of males (although she refers specifically to tigers not human men) -"*It can't be a female tiger… it must a male one… Female tigers can be a bit less fierce, but male tigers are very fierce…*" (PB7).

In terms of appearance floods are seen to be big or huge (giant) men (Figure 5.10), who come with the express purpose to cause damage to people and their belongings - "*He damages… Does harm to people… ruin things…*" (PB9); "*It destroys everything in its path…*" (PB6). In this regard some degree of humanity is identified within their description, although again the image of humanity is distorted to reflect size of threat and destructive qualities. In the face of this perception of the scope and intentions of floods, they recognise their own weaknesses and that much to do about floods is beyond their control. One informant commented that "*Yes, when the water comes in. Feels like everything will be lost. But that's normal to feel that way…*" (PB8), which encompasses most of the responses informants indicated as having towards this flood-person/monster. They feel things are beyond their control and fear it. They also know that they can't give into this fear and must fight against the monster despite their fear. It may be this ability to look past their fears and embrace the fight that plays a significant part in their resilience to floods.

Changing flood dynamics, uncertainty and floods as a part of life

Although flooding is an event that all informants have experienced and most likely expect will happen again, there is some uncertainty around threat probability amongst informants. Figure 5.11 shows a conceptual plot of the variables influencing flood threat probability assessment being carried out by informants. Flooding being a 'part of life in Dhaka' was assumed (by the author) to be the dominant theme within informants' responses; however, this was not what emerged. Instead three main themes were identified (Figure 5.11):

- 'Uncertainty' about future floods;
- 'Changing' dynamics of flooding; and
- Floods as a 'part of life' in Dhaka.

The three themes appear to be connected to each other and feeding into informants' perceptions on the probability of flooding. In addition there are elements of 'wishful thinking' attached to the 'uncertainty' and the 'changing' theme, in that the uncertainty perceived by informants, also enables them to believe that it may not happen again and gives room for their faith to play a role in their protection - "*We pray to God so that he doesn't let us see this person again*" (PB6) (Figure 5.10). Alternatively there is an acceptance of the fact that "*it doesn't flood every year*" (PB6) and "*there are no certainties, it might happen... Yes, it might get worse*" (PB4) (Figure 5.11).

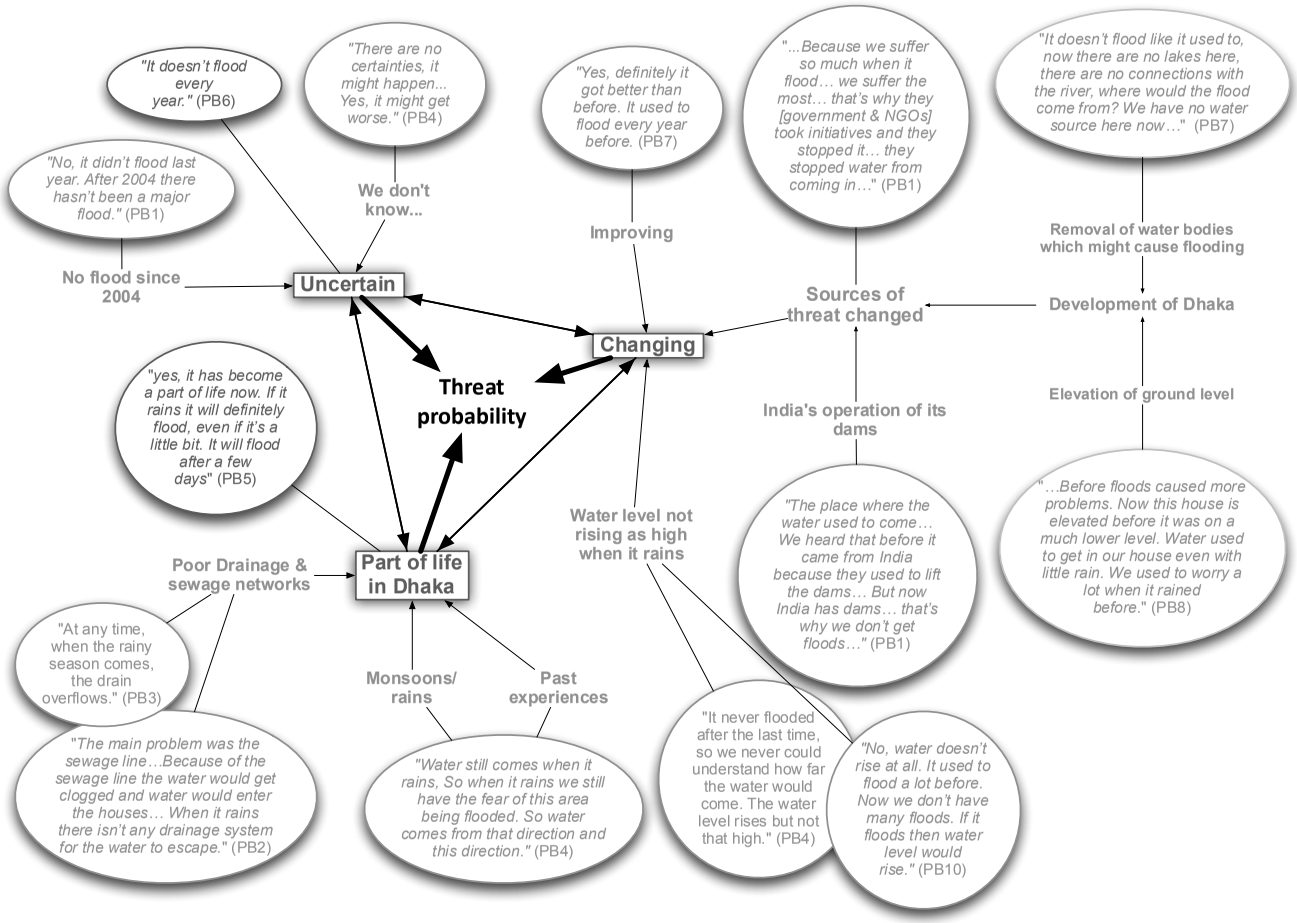

Figure 5.11 Conceptual plot of informants' responses around their appraisal of the probability of a flood event in Badda, Dhaka City.

The context in which informants live is one marked by rapid change and extremes. The rate of urbanisation is such that within a space of two years informants have seen fairly rural conditions turn into urban, with the development of infrastructure like roads, buildings, and the provision of basic utilities like electricity and access to better education for their children - "*It flooded every year during the monsoon season and we had to struggle every year. Now by the grace of God things are more convenient now. We have electricity, gas and water supply; these utilities were not here before. We have a lot of advantages now. It's good that I can send my children to school, that's also very convenient now.* "(PB4). These developments are seen as improvements, and "*everything is just more convenient and easy to get*" (PB4), but on the other hand, their economic positions and social standing places them in the direct path of floods. They either do not have the means to move to better accommodation - "*We find it a bit hard living here and paying the rent that we pay. If I could stay in Gulshan and Banani [*up-market and expat areas of Dhaka*] like you then I would enjoy it too. We can't afford that… But we have been living here for a long time. So it feels quite nice to live here*" (PB8), or the desire to move up, instead preferring to stay within the safety of the communities they have lived most of their lives with (Box 5.7).

Box 5.7 Excerpts indicating informants' preference to stay in their communities.

- "*Yes, everyone here is like my family… We have our actual family members around this area too. Everyone knows me, they know my name. The new tenants that come I get familiar with them gradually. But there are many people who have been here for a really long time. I know all of them…*" (PB5);
- "*Like I'm living here, I know all the people. When I am in danger I get help from them. When someone else needs help we do the same for them. So isn't it better for us if we knew each other? I think everyone is very close to me, when you think otherwise they won't be close to you. I feel like everyone is my kin*" (PB7).

The development of Badda has largely underpinned the 'changing' nature of flooding in Badda (Figure 5.11). Urbanisation has lead to elevation of land for buildings and roads, and this has decreased the average floodwater depths that informants are experiencing now, as compared to 2-5 years ago - *"Before floods caused more problems. Now this house is elevated before it was on a much lower level. Water used to get in our house even with little rain. We used*

to worry a lot when it rained before." (PB8). Also there has been removal of water bodies and sources, which used to contribute to floodwater levels, this removal is seen by one informant to be a reason why "*it doesn't flood like it used to, now there are no lakes here, there are no connections with the river, where would the flood come from? We have no water source here now…*" (PB7).

In addition to the affects urbanisation is having on flood dynamics, informants are aware of some of the chief variables behind the larger flood events of 1988 and 1998, specifically the influence the opening of dams upstream in India has on downstream flood experiences (Figure 5.11). At least two informants are aware that their government has taken steps to ensure that upstream dams are not a contributor to flooding - "*The place where the water used to come… We heard that before it came from India because they used to lift the dams… But now India has dams… that's why we don't get floods…*"(PB1). Other informants simply recognise a change in flood dynamics (Box 5.8).

Box 5.8 Excerpts indicating informants' awareness of changes in flood dynamics.

- "*Yes, definitely it got better than before. It used to flood every year before…*" (PB7);
- "*It never flooded after the last time, so we never could understand how far the water would come. The water level rises but not that high*." (PB4);
- "*No, water doesn't rise at all. It used to flood a lot before. Now we don't have many floods. If it floods then water level would rise*." (PB10).

Lastly flooding is a 'part of life' in Dhaka (Figure 5.11), and informants recognise this - "*yes, it has become a part of life now. If it rains it will definitely flood, even if it's a little bit. It will flood after a few days*" (PB5). One of the main kinds of flooding informants do expect to encounter regularly is urban flooding from water logging - "*At any time, when the rainy season comes, the drain overflows*" (PB3). Poor drainage and sewage networks create a situation where informants, who are often living at the same level as drains or even slightly lower are vulnerable to flooding caused by water logging and over-flow of the drains - "*But that line near the main road creates problems. Since our area is on a lower elevation water flows from the sewage lines to our area*" (PB2). Given their past experiences with both urban and fluvial flooding, informants are not relaxed about the chances of flooding. Monsoons are an annual event, each

shower brings with it the chances that another big flood will occur - "*Water still comes when it rains, So when it rains we still have the fear of this area being flooded. So water comes from that direction and this direction*" (PB4).

The most severe floods to informants involve those that are both fluvial and pluvial in origin, have water heights that not only reach their doorsteps, but also enter into their homes, and have a duration that is longer than a month (Table 5.8). In assessing the potential severity of a flood informants live with a year to year uncertainty of flood extent and impact - "*there are no certainties, it might happen... Yes, it might get worse*" (PB4), but an awareness born from experience that the bigger the flood the more damage they can expect (Table 5.8).

Informants do not take floods lightly, and perceive the full severity of impacts they can bring. This awareness is reflected in the fear they have in regards to flooding; Table 5.9 lists some of the different types of fears informants indicated as having regarding the 'prospect of' future events (some compared to their experience of past events), the 'event of' certain aspects or impacts related to flooding happening, and lastly the 'effects of' flooding on their family or themselves.

Table 5.9 Informants' fears related to flooding.

Prospect of (an event that can or may occur relating to future flooding or flood experience)**:**	**Event of** (aspects or impacts caused or associated with flooding that cause fear)**:**	**Effects of** (impacts of flooding on family or self, or the consequences of a flood event)**:**
Big flood event (as experienced before): • "*Bad as in very bad… Frightening…*" (PB9); • "*We pray to God so that he doesn't let us see this person again.*"(PB6); • "*To me tiger is the scariest animal, it's very hard to survive you face it one on one…*" (PB7). **Being powerlessness to stop it:** • "*We have nothing to stop it from coming… We can kill a snake by hitting it on the head but when the streams*	**Water getting into the house:** • *"...but when the water comes inside the house situation becomes dire…very troublesome*" (PB9). **Snakes coming in:** • "*The scariest things are the snakes…Snakes are worse than the food crisis…*"(PB10). **Not being able to move around:** • "*When the water level keeps rising I feel even more tensed… I feel like*	**Children playing or having to spend time in the water:** • "*I don't get out much. But if I do then my biggest concern is about my children. What if they fall in a ditch? What will happen if they do? I worry about those things…*"(PB5); • "*What if the water came in our house… what if the children get into the water they might get sick… they can die if they fall into the water… we are frightened of those thoughts… Kids can swallow some of that*

Prospect of (an event that can or may occur relating to future flooding or flood experience)**:**	**Event of** (aspects or impacts caused or associated with flooding that cause fear)**:**	**Effects of** (impacts of flooding on family or self, or the consequences of a flood event)**:**
of water come…"(PB8). **Rains bringing more floods:** • "*Water still comes when it rains, So when it rains we still have the fear of this area being flooded. So water comes from that direction and this direction*" (PB4). **Hearing a big flood was on its way**: • "*It would be something to fear. We would be frightened before it came*"(PB5).	*the roads will be flooded…*" (PB9); • "*In the city it is impossible to travel without a boat. It's not safe to get in the water*"(PB10).	*water…*" (PB9). **Dirty flood water on the health of their family or selves:** • "*The flood water in Dhaka city isn't like other places. It's very dirty and if it touches your skin you would get skin diseases, boils etc. It was a problem even getting down in the water*" (PB8). **Lack of earning capacity:** • "*My husband won't be able to drive…"* (PB9). **All that water receding afterwards:** • "*It's more frightening* [post flood]. *Mud, water, flies…Because there was water and mud all over the place…*"(PB6).

It should be noted that these typologies of fears informants indicated as having are constructed (by the author) to provide a breakdown in what informants fear. However, the fear/s informants have is/are to them a constant companion they have learned to live with over the years, what's more they obtain a significant degree of identity and personal and community pride from their belief in their ability to survive despite their fears (Box 5.9).

Box 5.9 Informants' sense of identity and personal pride relating to their ability to survive.

- "*But the one due to the drainage problem doesn't stay for a long period… Because it's caused by people… Everyone gets together, takes steps and fixes the issue…*" (PB1);
- "*We have inner power and we have courage because of God's grace*" (PB6);
- "*We wouldn't survive this long if we didn't fight… The biggest weapon we have is willpower…*" (PB7);
- "*Yes, when the water comes in. Feels like everything will be lost. But that's normal to feel that way… We can't become nervous, we have to have will power, we have to gain more strength… We must keep on fighting, we can't let go of the hope we have… then everything will be lost*" (PB8).

What is evident from Table 5.9 is that flooding carries emotional attachments and these emotional aspects have an influence on how the informants perceive flooding. On the one side there is the fears informants have regarding flooding,

and on the other the pride and encouragement informants get from each other and the ability to survive and fight.

Informants' perceived need to prepare.

Although informants appear to be hoping that another big flood will not take place, the three aspects of their assessment of threat probability has the dual role of bringing comfort, through uncertainty and change, and keeping them on their toes and prepared for the worse through experience of life in Badda. This is seen within the perceptions informants have regarding their need to prepare (Box 5.10).

Informants perceive the importance of preparing, because although they live with the uncertainty as to whether it will flood or not, they know the extent to which it has flooded in the past, and like wise the extent of the impacts they face should they not prepare for the possibility of a flood. This also points to the degree of influence prior experience has (Section 5.2).

Box 5.10 Informants' perceptions of their need to prepare.

- "*It doesn't flood every year… But we still prepare. Buy bamboos and safe save some money*" (PB6);
- "*We can't become nervous, we have to have will power, we have to gain more strength...We must keep on fighting, we can't let go of the hope we have… then everything will be lost*" (PB8);
- "*Suppose it flooded here before… it will flood this time also… so we prepare from before hand…Our things can get spoiled so we take steps from before hands…*" (PB9).

5.5.2 Coping Appraisal

When it comes to how informants appraise their ability to cope with the threat of flooding, the overarching reality that they live with is 'I have to cope'. Informants feel the affects of flooding acutely and directly on all aspects of their lives (i.e. family, livelihood, community, self etc.), however, they do not have the option, and in many instances do not wish to move. As such their only option is to learn to survive floods, to develop the ability to cope with flooding, this reality is reflected in their responses. In terms of self-efficacy informants appear to assess their coping ability around three main themes: 'ability', 'physical influences' and 'sources of strength'. Figure 5.12, shows these themes as they all lead into informants' discussions around their awareness of the importance

of being able to cope. The following sections breakdown and discuss these themes further.

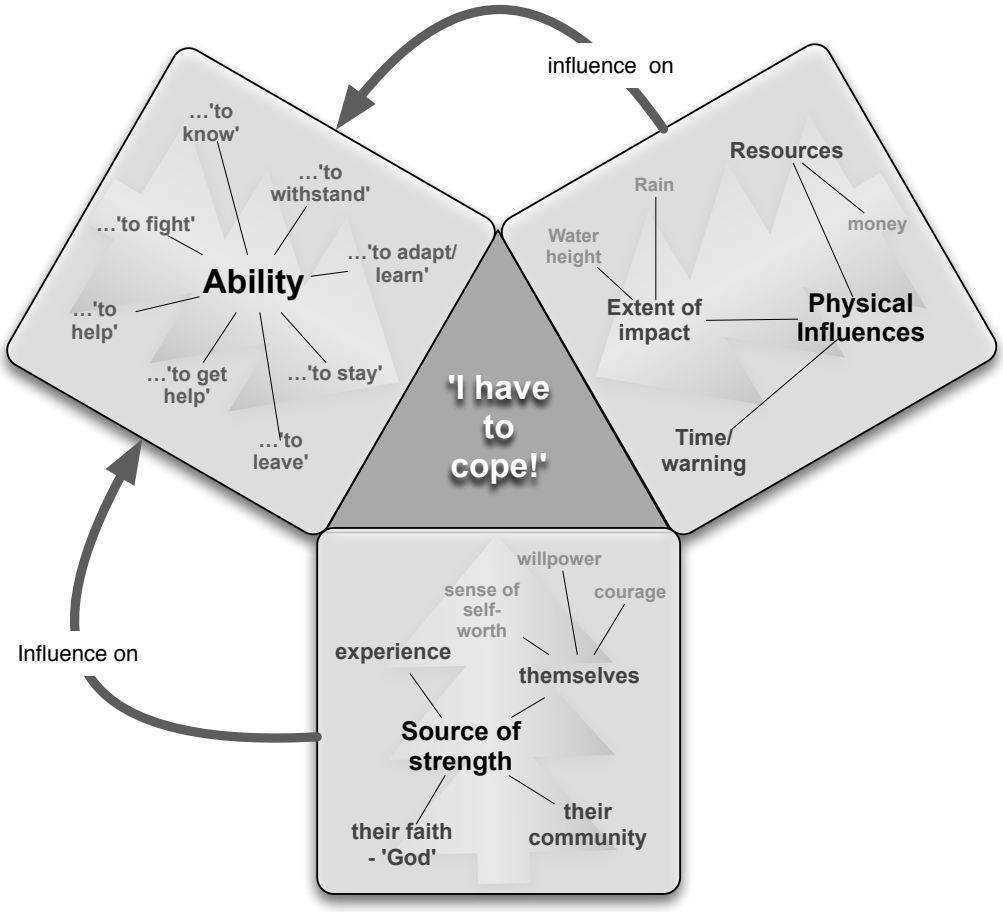

Figure 5.12 Themes around which informants focus when discussing their ability to cope with floods in Badda, Dhaka City.

Ability

In terms of coping with floods informants' discussions carry an emphasis on ability. Ability represents a large concept made up by a collection of actions seen as important in enabling survival during floods. These actions and supporting excerpts are provided in Table 5.10.

Table 5.10 Summary of breakdown of [coping] 'ability' theme and supporting excerpts for informants in Badda, Dhaka City.

Ability	Excerpts
'To fight'	• "*But the one due to the drainage problem doesn't stay for a long period… Because it's caused by people… Everyone gets together, takes steps and fixes the issue…"* (PB1); • "*We wouldn't survive this long if we didn't fight… The biggest weapon we have is willpower…"* (PB7); • "*We can't become nervous, we have to have will power, we have to gain more strength...We must keep on fighting, we can't let go of the hope we have… then everything will be lost*." (PB8).
'To withstand'/ 'to persevere'	• "*We were surrounded by water, if we stood near the roads they brought us here on boat. We came here even when there was water around*." (PB3); • "*We need determination. We see this hell descending upon us. We need to be determined to face it head on. It tells us to go buy bamboos and buy ropes…*" (PB6); • "*Yes, when the water comes in. Feels like everything will be lost. But that's normal to feel that way… We can't become nervous, we have to have will power, we have to gain more strength*." (PB9); • "*When flood comes we are empowered from within. We have to raise the belongings, save the children, then the power develops itself…*" (PB8).
'To give help'	• "*I helped my slum. I made them get reliefs from three different NGOs… There was about 371 houses in the slum…I helped them get rice, lentils and salt from those NGOs…*" (PB1); • "*I prepare myself. It seems sometimes a lot of people doesn't know what I know. I tell others what to do. Not to let the children get in the water, to keep the things tidy. I help the new people; tell the people who can't swim not to get on the boats. I do as much I can to help. If they don't have food when I cook I give them something. If they don't have money I try to help with money…*" (PB5); • "*I felt really good at that time. We went on field duty. To see how people are doing. Then we had a meeting to find out what can we give them. Like medicine, saline, water purification tablets, soap. Before that we gave them rice and lentils also. We had to struggle a lot to distribute the relief but it was worth it. We went together and served. It felt great*." (PB8).
'To get help'	• "*We lived on the roof, we got soap and flat rice from people. The foreigners also came to help. People from different places came on trawlers* [Small motorised boat] *and gave us rice and lentils as no one could go to the bazaar. No one had a boat. This happened in 2004 and 1998. In those two floods*." (PB4); • "*When the flood is not that high, we have some ways to survive… We can tell someone that we are dying here, so they help us… But if it floods everywhere then we don't get any help…Suppose if you had a high raised building… then you can see people suffering and you can offer them help… But if everyone is facing problems… then they are busy with themselves… and don't have time for others…*" (PB7).
'To know'	• "*I would fix up any of the small holes or any other issues that can cause problems in our house, try to harness the roof and make it sturdy. I would buy dry food by calculating the amount of days we can live off that food, some medicines, saline*." (PB4); • "*Tidy everything up. Buy bamboos, ropes. Make machas* [platforms constructed to raise belongings]*, raise the house. Stay with my children. Also look for other places to stay in advance… if we couldn't stay here. So keep the other place as plan B*" (PB6).
'To learn'/ 'to adapt'	• "*Whatever I learnt from those experiences I used them later…*" (PB5);

Ability	Excerpts
	• "*You learn to walk when you fall again again…*" (PB10);
'To leave'	• "*I will be cautious and go somewhere safe with my family. We can worry about the belongings later. If we are alive we can get more belongings later*." (PB8); • "*I have to look after my own children… who will depend on who… We can go to our relatives house… but we can't stay there for too long… everyone is in distress at that time… How many days can we depend on someone else? May be two or three days… we can disturb someone. Then we feel guilty ourselves… So we try to live in our house even though it is difficult… When we can't take it anymore we move to our relatives' house… but we try to be on our own as long as we can…*" (PB9).
'To stay'	"*A lot of them got spoiled… You can't save everything… You can't elevate everything…If we lived here then we could've saved some more.. but some would get spoiled for sure…*" (PB9).

'To fight' (Table 5.10) involves finding the strength to overcome their fears and find the courage to do what they must in the face of their struggles (impacts, Section 5.2). Fighting might be achieved through collective action by the community to fix a drain or construct protective barriers, or by an individual who does what they can to protect their belongings in the face of overwhelming odds. In this regards, the ability 'to fight' is closely related to the ability 'to withstand' and/or 'persevere', which encapsulates informants' awareness of their situation, acceptance of it and decisions to keep fighting even as rising water level pushes them and their families onto the roofs of their homes. What is interesting is that their recognition of their ability 'to fight' and 'withstand' appears to have become part of their personal sense of identity and pride. As seen from some of the excerpts in Table 5.10, informants speak of their ability to find the [will] power to persevere within a tone of respect and sense of self-worth. Sentiment that is further established in one informant's comment - "*If we count we fight the flood every year*" (PB5).

'To give help' was indicated by three informants (Table 5.10) as making them 'feel good'. This is an emotive effect that acts in encouraging informants. It may be that this encouragement stems from a decrease in their sense of helplessness or powerlessness, which are (affective/emotional) experiences other informants mentioned as experiencing - "*Yes… I do feel helpless… What can I do to save myself? I have nothing to do… no way left…*" (PB9).

Being able to help others may also carry deep cultural and religious significance for the informants, as it stands to influence their place in the social hierarchy in

which they live, and enable them to be seen as obedient before Allah. Bangladeshi culture is like most Southeast Asian societies hierarchal, with aspects of the caste system active; however, unlike many other Southeast Asian countries it has developed on Islamic precepts. Urban-poor communities in general represent those people who are considered to be among the lowest of the low. They are workers and labourers with very little power or say in the greater governance of city. They are also those who are perceived by higher ranking communities as those who one should be giving aid to, be it for religious reasons, or societal. So being able to obtain the ability to help others during floods (despite being affected themselves by flood events) helps raise their identities and authority in the eyes of their local communities, and gives them an increased sense of self-worth.

'To get help' represents a sort of a buffer ability or option (Table 5.10), although asking for help from their local neighbours ("*You cannot describe those moments with words… you won't understand unless you see it with your own eyes… People like us who are lower middle class or middle class we can't ask other like the poor people or have things when ever we want like the rich people who always have stocks of money or savings… We feel like death is inevitable at that point…*" PB10), or their more wealthy neighbours ("*What if we did ask for help and they rejected us right on our face? What then? We would be deeply ashamed and we wouldn't have anything solved either…*" PB10) are actions that they feel would ultimate degrade them socially; their awareness of the seriousness of flood events very often overshadows their pride - "*At that time if someone does a little, it feels like that they have done a lot…When someone doesn't help at all… we feel bad that we are in such trouble and no one is bothering to help us…*" (PB7).

'To know' indicates informants' ability to have knowledge of coping strategies they can use to protect themselves, their families and their belongings. Most informants when posed with a scenario that a flood was imminent had a clear (easily accessible) list in their heads of what they would do, or what needed to be done (Table 5.10). Most often, informants could also say whether a few

days notice was sufficient to enable them to prepare - "*We won't be able to go somewhere safe in that short span of time* [days warning]" (PB5).

'To learn/ to adapt' are abilities informants recognise as being the result of having to face floods and the threat of flooding on an annual basis (Table 5.10). Being able to learn from prior experiences was mentioned by at least one informant as enabling them to better understand ['know'] what to do the next time a flood event occurred - "*I learned a lot. I didn't know what to do when floods come at first. So when I faced flood for the first time I lost a lot of things. 2nd time I understood things better.*" (PB5). This ability to learn and improve in ability to protect themselves had the added benefit of encouraging informants - "*Yes…. I can now. I have the courage now. Before I didn't know what to do, what to think. My husband used to provide and I just ate and slept. But now I know how to save. I have the courage to face things without my husband. I am no longer dependant to him. I have that determination now… We learnt from the struggles… We learnt how to save and prepare before the floods. Learnt to be patient…*" (PB10).

'To leave' & 'to stay' really represent two sides of the same coin (Table 5.10). Although staying during a flood event are informants' preference, as they are able to then watch over their belongings and property, the ability to stay largely depends on the extent of the flood. The higher the floodwaters come in their homes, the less they are able to stay in their houses. In extreme events like in 1988 and 1998 floodwaters came so high that most informants ended up living on their roofs - "i*n 1998 water level was very high… We lived on the roof of our house and so did many other families… People who had boats, they slept on boats… many people slept on roads by placing papers on the streets…*" (PB7). Many could not even stay on their roof and the ability to leave and go somewhere safe became an important ability.

Being able to leave involves having somewhere safe to go; somewhere to the women of this study where their children would be safe, and they would be able to cook for their families. However, emergency shelters organised in local schools etc., are most often so overcrowded that carrying out these duties are

difficult - "*We lived there for a month. There were thousands of people over there…We couldn't cook and eat ourselves… We starved the whole day. They* [shelter organisers] *didn't allow us to light the stoves in the morning. They thought it would create a lot of rubbish in the school premises*." (PB1). Having relatives in areas not so affected, or in the rural areas represented a chief characteristic of having the ability to leave, but one informant mentioned that even that had limits - "*We can go to our relatives house… but we can't stay there for too long… everyone is in distress at that time… How many days can we depend on someone else? May be two or three days… we can disturb someone. Then we feel guilty ourselves… So we try to live in our house even though it is difficult… When we can't take it anymore we move to our relatives' house… but we try to be on our own as long as we can…*" (PB9). It would appear that to informants leaving one's home is something that is only done under the worst conditions - most see it as a last option. An option that in of itself ultimately involves finding refuge on the streets or in buildings under construction if the owners allow - " *Also look for other places to stay in advance… if we couldn't stay here. So keep the other place as plan B…* [where is higher ground] *those buildings*" (PB6).

Physical influences & source of strength

The two remaining themes (Figure 5.12) represent aspects of informants' lives that feedback to increase or decrease actual and/or perceived ability among informants for coping with floods. In this way both themes represent points that influence both 'ability' and coping in general, however, 'physical influences' involves those aspects that are largely beyond the control of informants and occur in the physical 'real' world. 'Source of strength' on the other hand includes more abstract aspects of informants' lives, they involve psychological, sociological and religious variables that act to give informants the strength to persevere, learn, fight etc. (i.e. ability). Table 5.11 summarises the breakdown of these two themes, and provides supporting excerpts.

Table 5.11 Summary of breakdown of the themes of 'influences' and 'source of strength' with supporting excerpts of informants from Badda, Dhaka City.

Physical Influences	Source of strength
Time/warning: • "*The sooner the better… If we can know sooner, then we would be able to save more of our belongings… But if it is very sudden then that's a problem*." (PB5); **Extent of impact/event**: • Rain [scenario] "*If it rained for 3 days we won't be able to get out of the house… If it rains for three days continuously how would we prepare? My husband won't be able to go to work; I won't be able to cook… We would just sit inside the house with our children… If the house breaks down… then if we can't take any of our belongings we can still take our children with us… So we would just take them and leave… Where ever we find shelter we would go there…*" (PB7); • Water height/ inundation - "*The one that is coming at present it won't do much damage. Water would be out of the house… The situation will be under control… We can use bamboo bridges to move about… but when the water comes inside the house situation becomes dire…very troublesome…*"(PB9); **Resources**: • Money/costs - "*Some people have good income they go to good places… They think before the flood that we will go to higher grounds… Some people cannot earn a lot and can't afford to be on higher grounds. They live here like us…*" (PB9); • "*If we have some savings we can still live…*" (PB10). • Food - "*We lived on the roof, we got soap and flat rice from people. The foreigners also came to help. People from different places came on trawlers [Small motorized boat] and gave us rice and lentils as no one could go to the bazaar. No one had a boat. This happened in 2004 and 1998. In those two floods*." (PB4).	**'From themselves:** • "*Yes, we took care of ourselves…*" (PB6); • "*We have to things… because it's my life… I have to solve my own problems… No one else would do it for me… We have to face the problems on our own…*" (PB7); • "*When flood comes we are empowered from within. We have to raise the belongings, save the children, then the power develops itself…*" (PB8); • Sense of self-worth - "*If we count we fight the flood every year.*" (PB5); • Willpower - "[Our] *Willpower* [enables them to persevere]" (PB6); • "*We wouldn't survive this long if we didn't fight… The biggest weapon we have is willpower…*" (PB7). • Courage - "*Yes…. I can now. I have the courage now. Before I didn't know what to do, what to think. My husband used to provide and I just ate and slept. But now I know how to save. I have the courage to face things without my husband. I am no longer dependent to him. I have that determination now.*" (PB10). **'From experience [& knowledge]':** • "*It doesn't flood every year… But we still prepare. Buy bamboos and safe save some money*." (PB6); **'From Faith / God':** • "*No* [don't lose hope], *we keep faith in our God. We do get frustrated…We get frustrated, but we keep faith in God...We have inner power and we have courage because of God's grace*." (PB6); • "*We have inner power and we have courage because of God's grace*" (PB6); • "*I become helpless.. So I ask God for strength and courage. I try doing that…*" (PB10). **'From their community':** • "*Yes, when everyone works together we get more determination to face the flood… Yes, together. If we fall we will fall together*." (PB6).

Physical influences mentioned by informants as having an impact on their ability to cope include (Table 5.11):

- The time they have to prepare and how much of a warning they get before the flood begins;

- The extent of the event itself (i.e. water depths and duration); and
- The availability of resources, predominately savings ('money') but also access to bamboo, bricks and food.

Sources of strength include (Table 5.11):

- 'Themselves';
- 'Their community''
- 'Their faith'; and
- 'Their prior experience'.

Having lived through floods successfully in the past appears to give informants encouragement that they ('themselves') can survive future floods. They receive from these successes a sense of worth and identity that feedback to helping them believe that they can withstand, persevere, fight etc. In reflecting on this quality they describe it as an inner power, or more often as 'willpower'. They believe that because they have faced floods before and had to find this 'inner power' to survive, and succeeded they are more able to face the next flood and survive. Such a perception of personal coping capacity may be an important component to what makes them psychologically and to some degree physically resilient to urban floods.

Religious beliefs ('their faith') represent a significant source of strength for informants - "*I become helpless… So I ask God for strength and courage. I try doing that…*" (PB10). When faced with an impending flood event and its implications and struggles ("*We see this hell descending upon us. We need to be determined to face it head on*" PB6) informants turn to their faith to help bolster their resolve and seek the courage 'to fight'. Lastly informants find strength and determination from their local communities and the support they receive from their neighbours, friends and families (Table 5.11).

Awareness of vulnerability

Informants appear to be very aware of their vulnerability to flooding. The most mentioned variable relating to their vulnerability was elevation or ground level - "*Not here but in this area. That place was on a lower ground...If you came*

during that time you would see this place covered in water…" (PB1). With the development of the area and construction of more and more buildings, the average ground level has been raised. This elevation of ground level has benefitted many of the informants, in that they now are no longer annually impacted by water coming in their homes - "*Now this house is elevated before it was on a much lower level. Water used to get in our house even with little rain. We used to worry a lot when it rained before*" (PB8).

One informant mentioned the limitations their economic positions places on them - "*You cannot describe those moments with words… you won't understand unless you see it with your own eyes… People like us who are lower-middle class or middle class we can't ask other like the poor people or have things when ever we want like the rich people who always have stocks of money or savings… We feel like death is inevitable at that point…*" (PB10). This response implies their understanding of their vulnerability due to their limits on access to resources because of their financial situations, as well as their social standings.

Informants' perceptions of personal preparedness

In general when asked if they felt they were prepared for another flood event responses were positive (Box 5.11). For informants their prior experience is what equips them and enables them to be prepared for the next flood event.

Box 5.11 Informants' perceptions of their personal preparedness

- "[do you think you are prepared] *Yes, I think so.*" (PB4);
- "*Yes, they will be* [their children be prepared], *because we already faced it…*" (PB7);
- "[feels prepared for another flood] *Yes… People have more awareness now. They know what to do if a flood came. We have faced floods a lot of times before. So people are more aware now*" (PB8);
- "[feels prepared for another flood] *Yes… I kind of am*" (PB9);
- "[feels prepared for another flood] *Yes…I can fight now*" (PB10).

5.6 Coping responses: actions & strategies for coping with floods

As discussed in Section 5.5 informants have to cope with floods, and their frequent prior experience has engendered a cultural understanding of floods and their impacts. This means that its quite natural on numerous levels to

innately talk about how they dealt with a situation during a flood, because that is what they have all had to learn as a society faced with this reoccurring threat. Indeed such knowledge is passed on to subsequent generations through such discussion. Other points of this exploration have shown that being able to cope with a flood is a point of personal and cultural pride and respect; therefore, describing how it was achieved is a way of establishing self-worth. Table 5.12 lists the different coping strategies identified from informants' responses relative to the different categories of impacts and life aspects. Appendix C, Section C.6 presents excerpt tables for each of these categories as well as more extended discussion on the different coping strategies.

Table 5.12 Informants' strategies for keeping belongings protected from floodwaters. Supporting excerpts available in indicated tables and boxes in Appendix C.

Aspect of life	Categories impacted	Strategy
Physical context	Belongings (Table C.15)	• Raise belongings (elevate belongings above flood waters in home); • Move belongings (move belongings to other dry location/s); • Pack belongings (away in sacks & containers to try to protect them from being spoiled by the water); • Stay with belongings (in home); • Prioritize belongings (depending of value of things to informants)
	Utilities: Water & waste (Table C.16)	• Getting water from the submerged tube well by extending pipes out of it; • Raising the tube well tap above the water level with a metal pipe (Figure C.20a); • Fetching water from people who have managed to adapt their tube wells, or other more distant sources; • Being given water from aid organisations (Figure C.21); • Using purification tablets to try to make the available water safer to drink.
	Utilities: Electricity (Box C.7)	• Keep candles & matches; • Make mud stoves (Figure C.19a & B); • Cook with firewood.
Secondary hazards	Pests (Table C.17)	• Using chemical deterrents; • Limiting areas where snakes could hide; • Being aware that there is help; • Move away
Financial resources	Money (Table C.18)	• Selling property; • Borrowing money;

Aspect of life	Categories impacted	Strategy
		• Managing what money they do have carefully; • Saving up beforehand
Travel	Roads (Box C.8)	• Use boats.
Health & well-being [directly]	Health (Table C.20)	• Preparedness - store medicines; • Local remedies; • Get medical help; • Preventative actions & lessons.
Health & well-being [indirectly]	Clean water	See utilities strategies.
	Food (Table C.19)	• Storing dry food beforehand; • Getting it from relief organisations during a flood; • Sharing it with those in need; • Changing the times and number of times a day informants cook; • Making alternative dishes; • Using traditional mud stoves and firewood to cook; • Raising the stove on to a platform or the roof to cook.
Social context	Children (Box C.9)	• Tie them to platforms so that they can't fall into the water. • Send them to safety in the villages &/or with relatives living in non-flooded areas; • Carry children to school so that they do get wet or exposed to contaminated water; • Make them sit in the middle of family members on platforms so that they can't fall off.

Informants all make use of protective coping responses, and very few non-protective responses could be identified (i.e. faith in Allah). As Table 5.12 illustrates, the protective responses that informants have are diverse and adapted to the different impacts they face. They are also adapted to the awareness of flood events informants have and many of the actions taken are done relative to water height, extent and duration. Figure 5.13 presents a summary of informants' actions relative to impacts experienced at different floodwater depths.

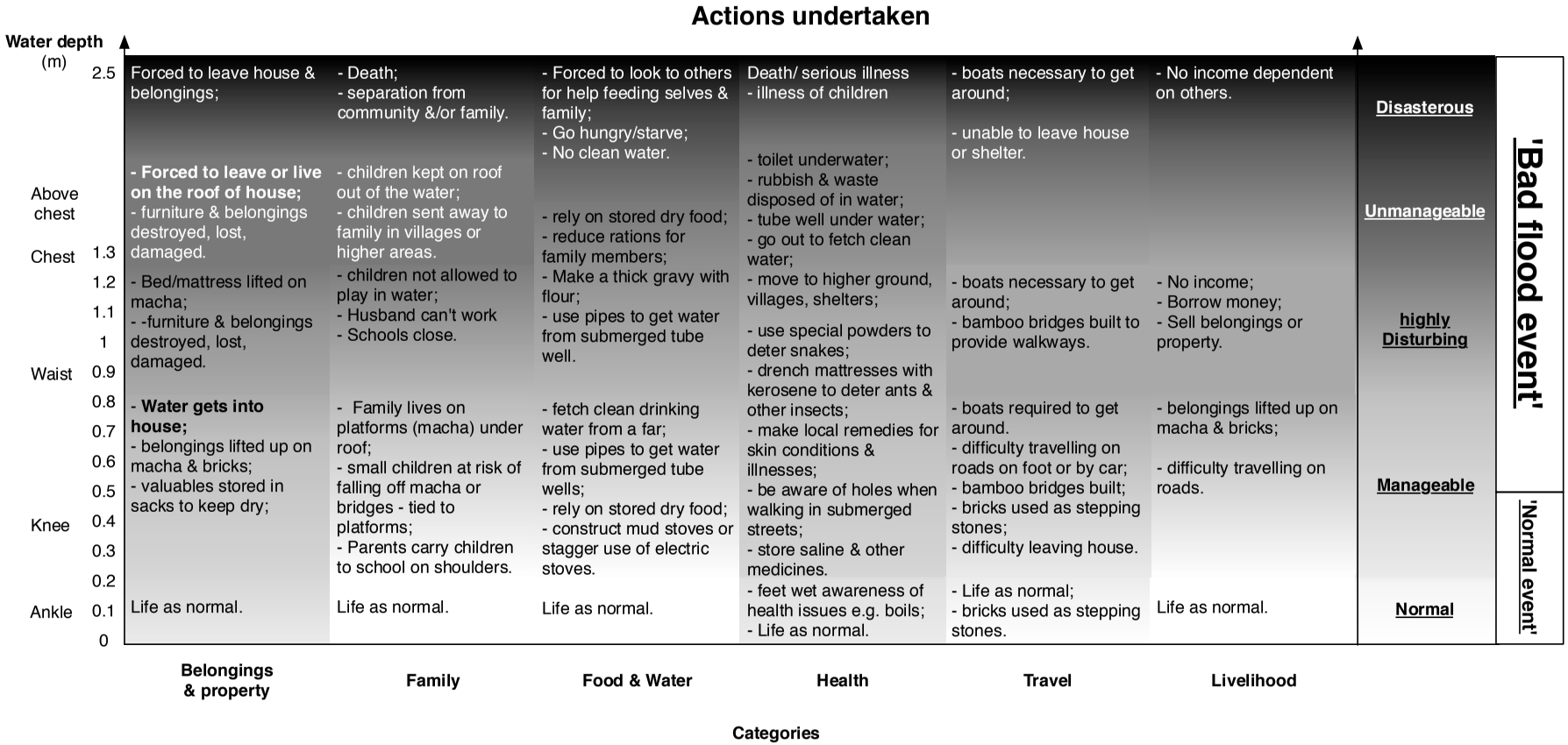

Figure 5.13 Informants' actions (in each aspect of life category) relative to floodwater depth.

The classifications of disastrous, unmanageable, highly disturbing, manageable and normal are taken from Peter-Guarin et al.'s (2012) classifications (Table A.3, Appendix A) and reflect the extents to which informants' coping strategies can help them manage during floods. Based on informants' classification of a 'Bad flood event' (Section 5.4), indication of this has also been included in Figure 5.13. The more unmanageable the situation, the worse the effects of impacts on informants and their families. Figure 5.13 is limited in that it does not include an indication of the relationship between flood depth, flood duration and informants' ability to cope or manage. Informants' interviews did not reveal sufficient discussion concerning the relationship between flood duration and actions taken to be able to include it here, however, it is emphasized that flood depth alone does not impact on informants' ability to manage/cope. Informants may experience a particularly deep event (>1.3m in depth) but consider it manageable as it only lasted 2 to 3 days, or alternatively an event with a depth between knee height and waist height that they consider disastrous as it last for months.

Having such a diverse array of protective coping strategies adapted to the awareness of flood dynamics, and the protective needs throughout the flood cycle, and relative to its depth (and duration) is perhaps indicative of a flood culture.

Chapter 6 Discussion & Reflections

This chapter has been split into three discussion points:

- The protection motivation and preparedness behaviour in the case contexts;
- Discussion on the theory and its components in exploring preparedness behaviour; and
- Reflection on the concept of protection motivation and how the findings of this research have contributed to understanding around flood preparedness behaviour.

6.1 Protection motivation & preparedness behaviour in case contexts

In both cases informants' responses have provided insight into how informants are appraising the threat of flooding, their ability to cope with it, and their responses to it. However, this study also provided insight into the role of SOI and contextual variables in shaping informants' perception of flood threat, and preparedness behaviour. The findings add understanding that can be used to improve risk communication, flood preparedness and social resilience estimates, in both cases specifically and other cities in general.

6.1.1 Wilhelmsburg, Hamburg

Findings suggest that informants in Wilhelmsburg have little to no actual protection motivation, and if extrapolated to the identified communities of Old Wilhelmsburgers, New Wilhelmsburgers, Students and Immigrants:

- Old Wilhelmsburgers appear to be individuals who have attended research workshops, sought to be involved in public discussions around developments and plans for the island, and carry an innate respect for the dikes and the role they play. As such they demonstrate more motivation to prepare, although still do not actually carry out any protective responses.
- New Wilhelmsburgers vary in their receipt and interest in 'deeper' risk messages and awareness; they vary in their connection to the island and intent on long-term residency on it. However, many of them have been attracted to the island because of its history and culture, and due to this are

interested in learning more about the different facets that make up life on Wilhelmsburg, including knowing more about its flood history and to a lesser degree the implications of this for their future on the island (especially if they are interested in buying property there). As such they vary in their individual levels of protection motivation, and as a group appear to have a cautious wait-and-see attitude. They to have not carried out any protective response, although they are more likely to have read the Sturmflut pamphlet and know where it is in the case of an emergency.

- Students live largely in total non-concern about potential future floods. Their time on the island is short, and they have very little connecting them to it. They demonstrate no protection motivation, nor interest in generating any, they also demonstrate no protective responses.
- Immigrants like students appear also to live in varying degrees of non-concern, their focus is more on social matters, and they are not directly involved in activities that deliver a deeper-risk message. The older informant demonstrated a more cautious attitude than the two younger informants. In general they did not appear overly interested in the topic, or in having to be concerned about it.

Reasons for the low to no protection motivation amongst informants from Wilhelmsburg appear to largely be related to the high reliance and trust they have in the dikes and the City to protect them. These act as significant sources of safety, and their effectiveness to date in protecting the island only strengthen this reliance informants have in these structures. Consequences of this faith in public protection include:

- Sources of information (SOI) concerning flood risk, flood legacy and flood preparedness to be interpreted in such a way as to affirm the trust and reliance residents have in the dikes and the city to take care of them. This may in the interim act to create comfort and safety among residents, however, in the long-term it acts to diminish any need to take responsibility of their protection and may even act in increasing their disinterest in the topic.

- Enable residents to lean on and justify non-protective responses to awareness of future flood risk.
- Reduce the likelihood of protective responses, and the generation of interest in investigating protective responses.

SOI in Wilhelmsburg act to inform, remind, and to an extent guide residents into considering their need to prepare for possible future floods. However, it was observed that risk communication in Wilhelmsburg is largely being met by attitudes of disinterest. Memoria like the flood marks are easily missed and more often no longer even observed, the emergency pamphlets sent out by the city are equally ignored and thrown away as being unimportant, and except for international disaster events, or flood events elsewhere in Germany the topic of flooding is rarely discussed among residents. Informants' attitudes towards risk communication around flooding in Wilhelmsburg appear to show elements of tedium (Lindell & Perry, 2004). Within studies done around the effectiveness of persuasive communication, it was found that in contexts with a low threat or at least the perceptions of low threat, repetition within risk communication messages has the effect of first increasing agreement with the message in that it provides opportunities for additional message processing, however, it then leads to decreased agreement as tedium sets in (Lindell & Perry, 2004). Its suggested here that risk communication in Wilhelmsburg has become tedious to its residents, especially as the lack of any events confirms their sense of safety.

By and large informants' sense of safety have established an organised schema (knowledge structure) regarding the situation on the island, and research indicates that those people with pre-existing schemas tend to resist and counter-argue messages that disagree with their existing beliefs (Lindell & Perry, 2004). In this regard, not only has the means by which flood risk is communicated to residents become common place and tedious, their messages are being interpreted as confirmations of safety, not indications of a need to consider preparedness options. For example, although the bus stop meeting points are a message that suggests there is a risk of flooding, and gives

observers a message of where they should go during a flood, people perceive these as signs that the city has things taken care of and they are comforted by them.

It should be pointed out that the schemas held by different people and community groups will vary. From the findings it is suggested that:

- Old Wilhelmsburgers will have schemas that are more open to identifying the risk message in the SOI about flooding, and be less likely, therefore, to counter-argue or disregard cautions about needing to prepare.
- New Wilhelmsburgers will have a mixed variety of schemas, but in general it is believed (by the author) that there will be an openness to these schemas in terms of hearing the risk message, but a greater chance of disregarding it than with Old Wilhelmsburgers.
- Students will have schemas that will be quick to dismiss the risk messages, and find it easy to ignore and count-argue the reasons for needing to be prepared.
- Immigrant communities may have language and culture schemas that:
    - Prevent them from understanding the risk message, or
    - Cause them to re-interpret them. For example, from informants' descriptions of events during bomb evacuations in Reihersteig, it appears that immigrants were weary of the police telling them they had to evacuate the area, and resisted risk messages about the possible dangers.

Access to the internet gave informants confidence that information is available should they need it, and when it is needed they will be able to see what should be done. However, there was very little need now to do anything.

Points of awareness that do appear to have the ability or potential ability to cause concern amongst informants includes:

- Historical awareness of the 1962 flood obtained from indirect communication with survivors, memoria and media.
- Media messages around climate change and future-sea-level rises.

- Changes to the geomorphology of the Elbe estuary due to dredging and harbor activities.
- Involvement in events that force residents to hear a deeper-risk message and consider coping strategies.

These points act as both sources of concern and uncertainty and make the probability of flooding more of a reality to informants, and it is believed residents in general. Given this it is the advice to risk communicators and emergency planners in Hamburg that such points present avenues through which to keep residents aware of the risk and [if only] semi-interested in maintaining their awareness. However, similarly to Bell (2007), this research does not support the assumption that understanding leads to persuasion. Old Wilhelmsburgers and several New Wilhelmsburgers demonstrated quite extensive understanding of the flood-risk situation, both from historical perspectives and future risks, but still demonstrated very little motivation to prepare. Which supports the notion that knowledge without experience is limited in its ability to lead to actual action.

This research does appear to support several other studies regarding social class and flood awareness in developed contexts (Fothergill et al., 1999; Burningham et al., 2007). Social class is seen to limit the flood awareness that members of lower classes (Burningham et al., 2007) and ethnic minority groups (Fothergill et al., 1999) have. In this study social class was related to immigrant status. Immigrant informants were observed to show high levels of uncertainty regarding future flooding and current flood risk, and even historical flooding. Additional observations included:

- That language could be a problem amongst these communities,
- Immigrant communities in general appeared (and were reported, pers. Comms, 2011) to be made up of lower incomer members.

One last point observed in this study and supported by others (Burningham, 2007), is that length of time lived on the island did appear to influence the level of flood awareness informants had. However, this did not necessary mean that these informants had higher levels of protection motivation. Shifts in protection motivation appeared to be influenced by direct experience with the 1962 flood.

An observation and possible concern that was identified during fieldwork was the role the city itself plays in proliferating the current levels of protection motivation. In terms of flood awareness and risk communication campaigns, the goals or perceptions of the city itself may be limiting their effectiveness:

- It may be that the city has a high sense of confidence in the defences it has created and planned for, and as such do not themselves feel the need to put out risk messages with any degree of urgency or need for preparedness activities.
- Creating a need in a context where this might never be necessary could carry unwanted consequences for the city:
    - First off it may create panic where the city does not want panic.
    - Panic may also create mass information seeking by residents that the city lacks the manpower to deal with effectively at present.
    - Urgent risk messages may create doubt concerning the city's ability to protect residents. This has two main implications:
        1. Within a demographic government, doubt relating to an administration's capacity to take care of its constituents is not favourable or wanted;
        2. During actual emergencies trust in government has been shown to affect how people respond to emergency risk communication (Wray et al., 2006). The city, therefore, needs for people to respond quickly and orderly to the information they would put out during any actual emergency, so creating distrust or discord through panic prior to one is not advantageous.
- In addition the city is currently building up Wilhelmsburg's image so to attract investors to the island, creating any doubt or sense of danger could negatively affect this goal and is thus not in the interest of the city.
- Alternatively the city itself is uncertain of the risks and how these risks may change in the near future, so they have done what they can, with the resources and understanding they have, and taken a wait-and-see approach

(while supporting and promoting research into the topic of future flood risk in the background).

Given these possibilities, it appears the city has taken a cautious approach in which residents' awareness (if somewhat residual) is sustained through organisational interactions, media messages, and memoria, that act to simply inform residents of their risks, and to a lesser degree their coping options.

6.1.2 Badda, Dhaka

The women interviewed in Badda all demonstrate a high motivation to protect themselves, and are able to report, describe and show the various coping strategies they employ to protect them, their families and their belongings. Indeed amongst these informants protection motivation appears to be an innate part of how they live their lives and think about floods. No difference in protection motivation was observed between informants from either side of the airport-road embankment.

In the few discussions the author had with members of higher income groups, the same level of protection motivation were not evident. Two young (early twenties, male and female) people spoken to indicated that being able to go to work by boat carries an element of excitement (pers. Comms, 2012). So although protection motivation is found to be high in the urban-poor in Badda, it is suggested that higher-income groups will have lower protection motivation - this is recommended for future research, as the views of other residents have not been explored (in the literature found for this study), and although it is advantageous to understand the most vulnerable communities' situations and actions, understanding other communities' perceptions and actions related to flooding is also important. It appears that in situations were flooding is frequent, lower-income earners and social classes/castes appear to have a higher awareness of flood risks than high classes.

Amongst informants a significant variable in their flood awareness and preparation approaches is experience. Flood experience has an influence on:

- The sense of self-worth and identity that informants have.

- On providing informants with clear understandings of what occurs during a flood, what they can expect to be impacted by, what they need to prepare for, and what they might experience.
- Diminishes their ability to rely on non-protective responses to deal with their fear.

Environmental information sources have the general characteristics of being supportive and part of local coping strategies. They act as warnings and guidance points (in terms of assessing need to prepare or what to prepare), and in this regard they are functional as apposed to just being informative. There is very little organisational interactions occurring between the community and outside organisations (i.e. government agents and organisations, NGOs), and, interestingly, there are not any real points of memoria in south Badda[55]. Flood awareness, appears, therefore, to be alive within living memory, and passed on from generation to generation (mother to child) and through personal [frequent] experiences. As such it forms part of the cultural norms and understandings within the community, and has little evidence within the physical environment. Subsequently, protection motivation amongst urban-poor communities in flood-frequent environments may also be considered a cultural norm, passed on through word-of-mouth and experience.

An outcome of this cultural understanding of flooding, is that their lifestyles have innate cultural aspects that carry flood defence significance and meaning, and enable people to know that in their daily lives there are already strategies they use that will protect them to a degree (e.g. keeping their cutlery and crockery and cooking utensils on raised shelves, keeping bricks and bamboos around).

The urban-poor in south Badda do not have the option to rely on their government to protect them from flooding; in fact very often in times of distress it is the very agents that should be seen to be protecting them that are monopolizing the distribution of aid and reducing its ability to sustain those in need. Although informants respect their government and local leaders, they are

[55] And Dhaka City – that could be found by the author.

under no disillusions that during a flood they must take personal responsibility for preparing and protecting themselves.

The high level of protection motivation, awareness of flood risks, impacts and coping strategies, integration of tools, and personal reliance are suggested here to be characteristics of a flood culture. Having such a flood culture will have the effect of improving the social resilience and vulnerability of a community to flooding. However, extreme events still have the ability to surpass the protective buffer of this culture.

Although women are consider a vulnerable group in terms of extent of impacts relating to natural disasters (Rashid & Michaud, 2000; Twigg, 2009), this study found that women are at the core of undertaking protective measures in the homes, and in many regards are responsible for holding and passing on the knowledge that enables future generations to cope with floods. From discussions with a few men it was observed that their focus is more on the protection of aspects external to the family unit, e.g. protection of a rickshaw, or living at work to ensure they can earn an income. One man spoken to, from a middle income background, could not mention one thing his wife did to protect the family and household, and spoke instead of ensuring the safety of his boats in the harbour (pers. Comm. 2012). His wife had, prior to his arrival been able to describe how she got in dried food, and stored up on water and other essentials the family would need during a flood. Their flat was situated several floors up so they didn't worry about damage to their property, although the wife did point out how difficult it was to walk along the streets with all the holes.

6.2 Theoretical discussion

Three main groups of concepts made up the conceptual framework (Figure 3.7) behind this research, these were: SOI, cognitive mediating processes, and protective responses. All of these are seen to occur and be influenced by the context in which people live. As would be expected given the differences in context, the findings of this research have found levels of protection motivation to vary between the two case sites. Although, these findings have been

explored relative to these concepts, it has been interesting to observe how people use them in their assessment of flood risk and flood preparedness needs and options. In part they were even identifiable in how informants responded to questions and discussions during the interview, in essence how they engaged the different cognitive mediating processes in response to the information source the interview itself represented. In this regard this study provides strong support towards the use of these concepts in the assessment of effectiveness of risk communication, as well as flood preparedness intentions and responses.

6.2.1 Prior experience's influence on SOI, cognitive processes & coping

In terms of information sources the role of direct experience amongst the communities (examined) in these case sites has been found to be an important influencing factor in how people examine, trust and interrupt SOI on flood risk, how they cognitively appraise the probability and severity of a future flood, their levels of fear and concern, and how they appraise their ability to cope and select response options. The influencing significance of experience to risk perception and flood [disaster] preparedness has been a focus of many studies (Weinstein, 1989; Norris et al., 1999; Sattler et al., 2000; Sasmita & Suar, 2007). These studies by and large have all found positive relationships between a person and/or community's prior experience and preparedness behaviours. The exception is Weinstein's (1989) review of the topic, in which he finds the evidence for the effect of past experience to be quite weak, however, he does note that many of the studies he reviewed failed to control for other correlates of precautionary behaviour.

Informants with prior experience

In this study it has been difficult to qualitatively separate out the influence of prior experience on cognitive processes and response selection amongst informants who live with floods. The annual nature of the floods experienced by informants in Dhaka, and frequency of major flood events (1988 1998, 2004, 2007) have made floods a part of their lives and consequently the protective

responses necessarily to reduce the impacts of these events have also become a part of life. In this respect the link between experience and behaviour supports the views of other authors (Sasmita & Suar, 2007) that prior experience facilitates flood preparedness. These informants demonstrate through their prior experience that they have clarity in their understanding of the risks flooding poses to them, which is built on both affective and cognitive components.

In terms of affective components, a fine dynamic is identified between the fear and worry informants have generated through negative past experiences, and a sense of worth or pride (personal identity) that they have from having survived and endured. Sattler et al., (2000) describe in their study a similar balance observable in the literature around psychopathologies and positive responses related to disaster survivors. These authors cite several studies that have found that increases in resiliency, self-esteem and self-control are reported positive responses to disasters.

Cognitively, another relationship that is supported in this exploration amongst Dhaka informants is that prior experience also has an influence on risk perception and perceptions of coping ability (Norris et al., 1999; Sasmita & Suar, 2007). Informants' all demonstrated personal awareness that there is a threat of flooding, and that although they are hopeful that a major flood will not occur again, they live with the awareness that it is more likely that one will. Informants also have no problem in visualizing the severity of a flood, as they have all lived through several catastrophic events. Indeed several studies have found that the severity of an experience has a direct influence on its ability to lead to the generation of risk perceptions and preparedness actions (Weinstein, 1989; Grothmann & Reusswig, 2006), and this is supported by the findings of this study.

Informants' knowledge of coping strategies and their limitations relative to nature of events (water depth, flood duration, flood extent, type of flood) has also equipped them with a clear understanding that 1. They have to cope there is no other option, and 2. That coping involves having the ability to respond

accordingly, they are also aware that they do not always have the ability to do what they need to cope, and in such times have to find sources of strength to empower them to survive and push on. These in turn feedback into their sense of self-esteem and resiliency.

In Wilhelmsburg, discussions with informants who had experienced the 1962 flood showed a level of clarity that was significantly better than those that had not. They were able to describe specific (on-the-ground) events and responses from a first-person perspective and make firmer assessments about the probability and severity of future floods from their experience. Although, at the time it had not been expected (by the author), these informants did demonstrate clearer senses of resiliency and self-efficacy in regards with being able to cope with another flood and confidence in their ability to help others during it. In this regard this study again supports the view that past experience does influence cognitive mediating processes. However, none of these informants had actually taken any preparedness steps – besides perhaps knowing where their important papers were and having read the Sturmflutz pamphlet.

Bubeck et al. (2012, pp.1491) cites the International Commission for the Protection of the Rhine (ICPR) as estimating '*that flood awareness diminishes within seven years after a flood and that only catastrophic disasters are remembered in the long term*' (ICPR, 2002). The limiting influences of experience in impacting a person's risk perceptions relative to the length of time since the experience has also been discussed by Weinstein (1989), who supports the view that the longer the time since incident the less impact that experience will be having on current risk perceptions and preparedness actions. All Badda informants showed a clear ability to recall the catastrophic floods they have experienced, indeed these are still very much a part of the living memory of the community. It could be speculated, however, that if another of these major floods did not occur for a decade or two, that awareness and resiliency amongst these informants may decrease. The limited number of events in Wilhelmsburg supports this view, in that the lack of subsequent events since 1962, has resulted in a society that recognizes the significance of the

catastrophic flood of 1962, however, for the most part have no prior experience of flooding themselves. As such demonstrate diminished perceptions of flood risk, little protection motivation and even less preparedness actions. It would be incorrect to attribute this purely to their lack of prior experience, but the lack of prior experience amongst these informants did mean that the clarity around which they could understand the risks to the island was reduced.

Informants without prior experience

Amongst informants with no prior experience a very different picture is observed. Here informants' perceptions of risk are based on external SOIs (indirect experience with similar events and from community interaction with those who had direct experience, organisational interactions, media messages, and environmental clues), awareness of flood history and public protection plans. These people tended to have created the perception that there was no real current flood threat, and live with a high sense of safety.

Lack of prior experience, therefore, was found to reduce informants' risk perceptions, protection motivation and protective responses. It was also observed that a lack of experience created growing disinterest in the topic and tedium with risk messages and communication.

Prior experience & flood history awareness vs. threat experience appraisal

Grothmann & Reusswig's (2006) concept of threat experience appraisal, is not presented as having a direct influence on threat appraisal and coping appraisal, and carries the implication of being a cognitive process onto its own. The finding of this research, could not qualitatively separate out the influence of prior experience from the cognitive processes, nor identify any clear assessment of past experience severity as having a direct influence in creating protection motivation or response. Badda informants appear to carry an understanding that there is no way of knowing how severe another flood will be, as each year is different. Wilhelmsburg informants carry a flood history awareness that places emphasis on the impacts of the flood (Figure 4.11), and in this way demonstrate the significance of potential severity on their thinking, and that their

assessment of this severity is based on past events. However, this for the most part has developed from environmental SOIs not prior experience. In this way the use of 'threat experience appraisal' may present a useful variable to investigate within more quantitative PMT studies, however, it is suggested that aspects of direct experience not be separated out from their influence on threat and coping appraisal, nor restricted to assessments of past severity. In addition, the use of threat experience appraisal in high-flood frequency environments would not be able to reflect the full influence of prior experience on the affective and cognitive processes, not to mention protection motivation. In low-frequency environments, there is a risk that this concept will not capture the effects of experience (as there may not be any), only reflect the influence of people's flood history awareness (outcomes of SOI). In this regard caution is advocated in how it is used, if used at all. Based on the findings and experiences of this research, the Author favours and advocates the use of prior experience (as a SOI) over threat experience appraisal.

Alternatively, the use of flood history awareness was not so clear-cut. In a low-flood frequency context like Wilhelmsburg, it was useful in exploring the knowledge and awareness of informants' with no prior experience, and was identified as influencing how they assessed future severity and probability. However, in Badda, the informant's flood history is so intimately tied to their present, that actually differentiating lessons learnt from prior experience and flood history awareness become obsolete. So the use of flood history awareness is not necessary in high-flood-frequency contexts; it is useful in low-flood frequency environments to build an understanding of what informants know of the past. However the use of it as a variable in PMT studies is not staunchly recommended, and the Author suggests that researchers assess their own need of it based on context and research objectives.

6.2.2 Threat appraisal

As described within Rogers (1983) description of PMT, threat appraisal in this study did involve the processes of perceived threat probability, perceived severity and fear. In addition to identifying these three previously described

processes (Rogers, 1983) this study also identified three variables around which threat probability was observed to occur (i.e. sources of safety, sources of concern and uncertainty).

Informants' threat probability assessments in the different case sites held interesting similarities. Figure 4.15 and 5.11 present diagrams of the different variables identified as being involved in informants' perceptions of flood probability in the different case sites. In Wilhelmsburg there was clear indication of a relationship between 'sources of safety', 'uncertainty' and 'sources of concern'. In Dhaka the same three variables can be identified, informants' awareness that floods are 'part of life' is a source of concern, it reminds informants that they aren't safe, floods have happened often and are very likely to happen again; 'changing conditions' are a source of safety, all the conditions that informants described as changing, were described as changing for the better in that they decreased the impacts of annual floods. Between these two, Dhaka informants also had uncertainty, generated more from the wishful thinking they have in hoping that the changing conditions will limit the extent to which floods are a part of life. In the first case, sources of safety are strong, and as such are decreasing informants' perception that a flood is probable in Wilhelmsburg. In the latter case, perceptions of floods being a 'part of life' are dominant and informants perceive floods as being probable.

Perception of flood severity differed between the two cases, and appeared to be influenced by prior experience. Wilhelmsburg informants have only media images and their imaginations to assess how severe a flood would be to the island, and their threat severity was largely linked with their historical awareness of events during the 1962 flood. Except for those who did experience this flood directly, it did not appear that informants could imagine the severity of the threat to themselves and thought in more broad and general terms, i.e. not how they might be impacted directly, but in how the island in general might be affected. Badda informants were able to comprehend the severity of floods, not only to their area and communities, but also to themselves and their families. Their

direct experience gave them clear cognitive and affective heuristics through which to judge the severity of future floods.

Figure 6.1 links the different processes (probability, severity, etc.) together and suggest a structure to the cognitive mediating process of threat appraisal. This structure indicates that to the degree that sources of safety are stronger than sources of concern to a person, then it is likely that their assessment of threat probability and severity will be diminished, and visa versa. However, as the uncertainty a person holds about the situation and/or either their sources of safety or concern increases, then their assessment of threat probability will be influenced. For example, should new risk messages be put out in Wilhelmsburg that the dikes are failing, then their uncertainty about them as sources of safety will increase, as will the strength of their sources of concern and force their belief about the unlikeliness of a flood to be reassessed. This was evident through the uncertainty they have about the future and climate change, risk messages related to these topics have the ability of shifting perceived probability toward likely and generate fear. Alternatively, if the changes in conditions in Badda result in flooding being minimised for several years (if not a major flood), then people's uncertainty about whether floods are such a way of life will be influenced, and their fear associated with this decreased.

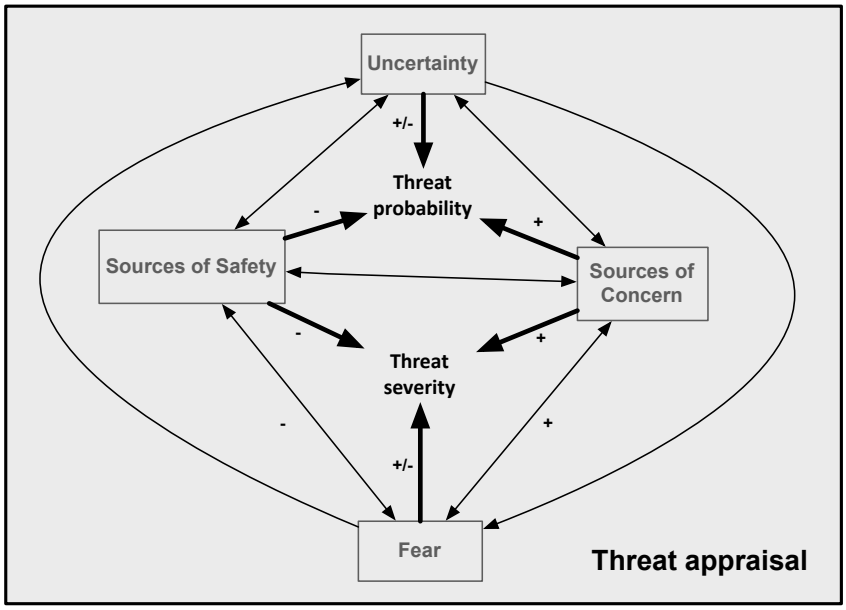

Figure 6.1 The process of threat appraisal as identified by this study.

'Fear' represents the emotional response that risk messages and experiences create (Rogers, 1983). In Wilhelmsburg there is not much fear about flood risk, however, in Badda floods are feared. Fear has the potential to influence people's belief in their sources of safety and concerns directly, or through the generation of uncertainty. Similarly uncertainty, sources of concern and changes in sources of safety can also generate fear. The level of fear a person holds influences how they perceive threat severity. For example as a person becomes concerned about the failing dikes in Wilhelmsburg, they are likely to begin trying to imagine how they and what they own might be affected by a possible flood event; alternatively the less fear they have, the less likely they will feel the need to put themselves in the assessment of severity, or even to perceive the need to think about potential severity of a flood to the island.

This study has observed that of the three aspects of threat appraisal (i.e. perceived probability, perceived severity and fear), it appears that a person will engage in processes that determine probability of a threat before considering severity of events. However, this may be related more to the degree that fear and uncertainty are dominant variables, at the time of this study, neither was found to be dominant in Wilhelmsburg, however, fear was dominant in Badda so perceived severity was an innate part of informants' descriptions. The process of threat appraisal is dynamic being always influenced by changes in context and the SOI a person is exposed to. Like a compass that is always swiveling to find magnetic north, a person's threat appraisal will be seeking to relieve any distress and reestablish a sense of comfort or safety - avoiding any cognitive dissonance[56] (Festinger, 1957). To achieve this a person can either be stimulated to consider protective coping options, or use non-protective responses.

[56] Cognitive dissonance is the excessive mental stress and discomfort experienced by an individual who holds two or more contradictory beliefs, ideas, or values at the same time (Festinger, 1957). In this case the perception of safety and the uncertainty about safety created by a risk message.

6.2.3 Coping appraisal & coping consciousness

Coping appraisal is the cognitive mediating process people use to assess their coping ability and options. It is a process that is believed to follow after threat appraisal, and only if certain thresholds in motivational energy are reached (Grothmann & Patt, 2003; Grothmann & Reusswig, 2006). This order was observed more in the case of Wilhelmsburg than Badda. In Wilhelmsburg informants' risk perceptions were more developed than their perceptions of coping ability, it appeared for New Wilhelmsburgers, Students and Immigrants that they began assessing their coping ability during the interview - with many pointing out that they hadn't thought about this or that. Old Wilhelmsburgers were those who were more likely to have been involved in past risk communication events[57] as such they had been previously exposed to situations in which they were encouraged to think about their protection options so had some pre-existing perceptions based on these. In Badda, however, past experience with floods and having to cope has created established coping strategies and mechanisms; to these informants coping appraisal in regards to flooding was a part of life. In this case it does not mean that some degree of threat appraisal did not have to be met before this became the norm, or that even now informants will assess the potential threat (through SOIs like media messages and environmental clues) before thinking about how they are going to cope, only that in this study it was difficult to distinguish an order between informants' threat appraisal and coping appraisal.

Findings in this study suggest that when threat appraisal is strong enough to stimulate an appraisal of coping options[58], then the first question informants were looking to answer was 'do I have to think about coping'. This was more evident in Wilhelmsburg than in Badda, as informants in Badda have moved passed this question years ago and live with an ever-present answer of 'I have to cope'. Figures 4.17 and 5.12 illustrate the findings of the coping appraisal informants' demonstrated in their responses. Although three aspects are

[57] E.g. research workshops and organisational interactions.
[58] Apart from SOI making direct reference to coping options.

described by Rogers (1983) in being involved in coping appraisal (perceived self-efficacy, perceived response-efficiency, and perceived personal cost), the dominant aspect identified in informants' responses was self-efficacy. To a lesser degree perceived response-efficiency was identified in Badda, but not perceived personal cost, and the opposite in Wilhelmsburg some personal cost but no response-efficiency[59]. This observation may be due to prior experience again; with prior experience people are more likely to consider threat severity and, therefore, be more likely to consider the efficiency of a protective response before costs. With no prior experience, cost becomes more relevant and efficiency is only considered when probability is high.

In both Wilhelmsburg and Badda a similarity was identified in the variables considered when considering coping need and options, these are:

- 'Awareness of own vulnerability',
- 'Physical influences', and
- 'Self-efficacy'.

The first two variables have the nature of overlapping with other processes described in PMT[60]. Both these variables can be described as elements of both threat appraisal and non-protective responses. This could mean that the interpretation of them as elements of coping appraisal is incorrect, or that the processes of PMT have a far more interconnected (almost synergistic) relationship with one another, and that people may in a conscious or unconscious effort to avoid cognitive dissonance be employing different processes simultaneously. It's suggested here that if this is the case, then it is likely to be more evident in cases with high degrees of uncertainty and less direct experience.

[59] It is recognised that this could be due to the interview schedules as the questions may not have elicited this information, and been skewed towards the investigation of risk perception. However, this is not considered a limitation of the study, as informants' responses still held rich information on how informants are thinking about coping, if not always deep-description of views on costs and response efficiencies.

[60] Again this could be considered an outcome of the analysis and interpretation process.

Alternatively, it could also mean that there is in fact a step between threat appraisal and coping appraisal that acts as a buffer and a filter of motivational energy. For the sake of discussion lets call this process coping consciousness, as it represents the awareness that there might be a need to think about coping[61]. Figure 6.2 presents a suggested view of how coping consciousness may be structured. As an interconnecting process, it appears that coping consciousness acts in personalising threat appraisal ('will I be affected'?, 'can I cope'? - in Badda this may be more collective 'will we be affected?', can we cope') and incorporating non-protective responses in diminishing any negative emotions[62] created by initial threat appraisal. This can be seen in the difference between the two cases, in Badda Figure 5.12 indicates that informants recognise that they have to cope, and so discuss the efficiency of their ability (i.e. coping efficiency) and sources of strength (i.e. self-efficacy), therefore, their appraisal of the threat has pushed them past this process and stimulated coping appraisal (as described by Rogers, 1983). However, in Wilhelmsburg, weak threat appraisal stimulates informants to consider their own vulnerability relative to their situation (geographical and social), and/or they couple this with an assessment of their beliefs about their own ability to cope (self-efficacy). In most incidents the results of these assessments had the properties of non-protective responses.

[61] Involving consideration of options, efficiencies, and costs.
[62] Or cognitive dissonance.

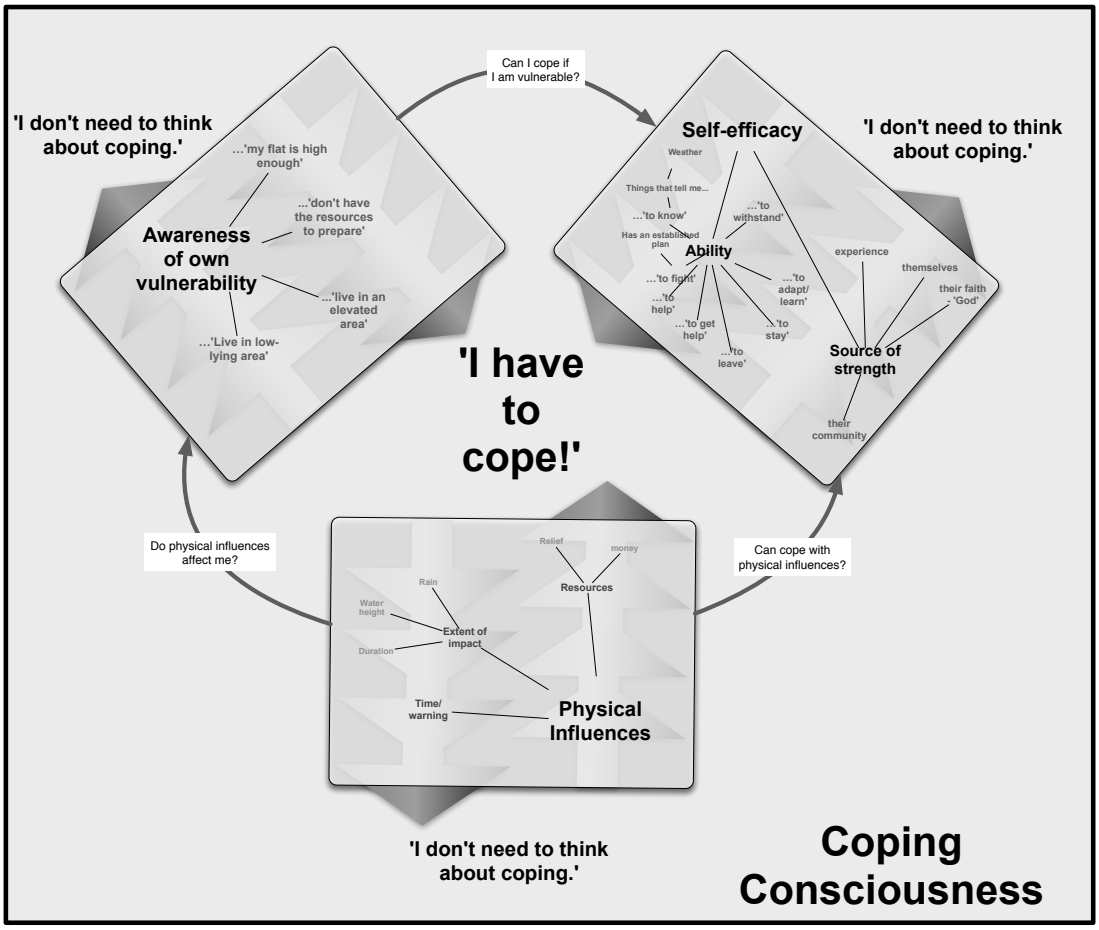

Figure 6.2 The process of coping consciousness.

Coping consciousness has the property of allowing a person to acknowledge that there might be at risk, but gives them means to say that it won't affect them. The validity of such an intermediary process being active in areas with low incidents, high potential consequences, is something that future research needs to substantiate and explore. It may be that there is more to the motivational threshold that Grothmann & Reusswig (2006) states has to be overcome before coping appraisal will be initiated, and that coping consciousness introduces a suggested step or process that helps in describing what stimulates coping appraisal - especially in contexts with in-frequent flooding, or risk messages that place emphasis on coping options. It is suggested by this study that it is overly simplistic to consider threat appraisal and coping appraisal to be the only cognitive processes involved in mediating the assessment of risk and coping.

In the meta-analysis reviews of PMT by Floyd et al. (2000) and Milne et al. (2000) strong support is provided to the relationship between preparedness behaviour and coping appraisal. This was confirmed in the study Bubeck et al. (2013) did involving 752 flood-prone households along the River Rhine in Germany. Indeed this study would also support that this significant relationship does exist in that the informants from Badda who did demonstrate a clearer coping appraisal also could describe and show established protective responses.

6.2.4 Protection Motivation Theory as viewed from this study

Figure 6.3 presents a view of PMT as it has been observed in this study. protection motivation is described by Rogers (1975 & 1983) as being '*an intervening variable with the characteristics of a motive*'. It is seen to intervene between the cognitive mediating processes and actual responses. In this regard the presence of protection motivation does not mean there will be action, only the likelihood of action, however, there needs to be protection motivation for action to take place. Motive is generated through an individual's threat appraisal, it adds positively to coping consciousness and to a lesser degree the development of protection motivation. The direct connection between threat appraisal and protection motivation can in extreme, shocking situations result in a person reacting without considering their coping options. In these circumstances fear triggers action (flight-or-fight responses); these actions are simple (i.e. run, jump, duck), and often only short-term playing the role of getting a person away from the danger in the immediate situation not considering long-term protection options.

Dependent on the strength of the motive established, or how easily coping consciousness and non-protective responses add doubt on the motive, coping appraisal is or is not initiated. Motives that can get past coping consciousness without being diminished in relevance, create motivational energy that leads to coping appraisal. Coping appraisal utilises the motivational energy to add substance to the motive by providing a defence strategy. A 'defence strategy'

represents a path of action that an individual feels they can achieve and is efficient, or alternatively (depending on the circumstances) has to be achieved.

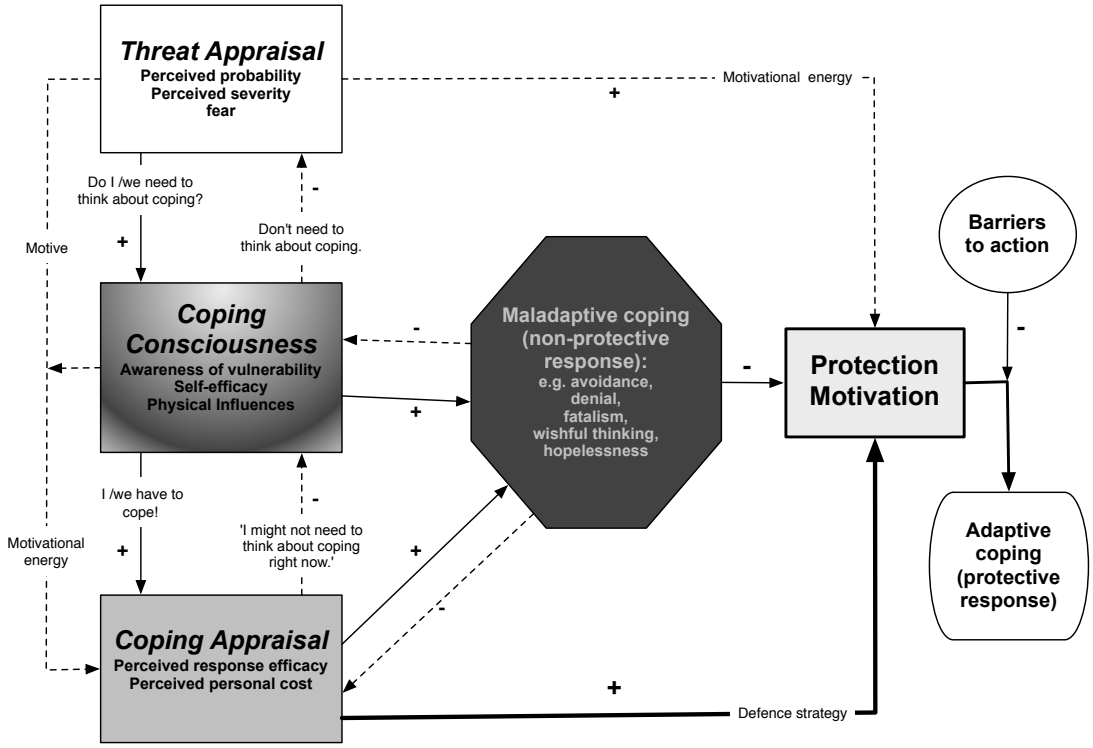

Figure 6.3 Protection Motivation Theory as observed from this study.

The outcomes of coping appraisal include the motive, the defence strategy and motivational energy these together form protection motivation. Protection motivation in turn can lead to protective responses, if not prevented from doing so by barriers to action (e.g. lack of resources, social support, or legislation). In addition, strong use of non-protective responses by an individual can also decrease the level of protection motivation formed. In many respects protection motivation appears to act as another threshold point in the whole process. Like coping consciousness it intervenes between the cognitive processes and actual action.

To end this section, it is emphasised that this is an explorative study so verification of theoretical points discussed here is recommended in future research, however, this exploration has added depth to our understanding of protection motivation generation in people, and in why some people might take action and others may not.

6.3 Reflections on the concept of protection motivation

It has become clear in carrying out this exploration that why people do or do not act is not a phenomenon that is so easily described. Like most social phenomena it is influenced by a kaleidoscope of social, physical, political, economic, historical and psychological variables. What's more these variables are in of themselves dynamic and often only temporally relevant, therefore, shifts in them will be influencing people's perceptions of flood risk and coping relative to their social, historical and physical contexts.

Protection motivation is an abstract and not easily grasped concept. In reflecting on the concept and its potential usefulness to vulnerability assessments, the construction of risk messages and communication, and preparedness and emergency planning, it was observed that although it is a concept arising from psychological literature and as such seen as a result of cognitive and affective processes (PMT), it can also be seen as a cultural attribute. This latter description considers protection motivation to be a construction of social and cultural influences in a person's life. These influences could involve community and organisational interactions, media messages, memoria and environmental clues and conditions. They act in presenting meaning systems around which a person or community develop cultural norms and understanding. In the context of flooding, a community living in a social environment that carries the innate understanding that flood risk is high and need to prepare necessary will have a high protection motivation, because the social amplification of risk messages and understanding (Kasperson et al., 1988) has lead to a situation where people innately understand the messages as part of their cultural norms and way of life (Douglas & Wildavsky, 1982; Oltedal et al., 2004). Of course community and organisational interactions, media messages, memoria and environmental clues and conditions are all included by Rogers in his 1983 version of Protection Motivation Theory, in so doing he includes recognition that the processes that create the motive of protection motivation may be explored from psychological dimensions, but are influenced by a broader spectrum of influencing SOIs.

Protection motivation as a cultural attribute could be considered indicative of the presence of a disaster [flood] culture, it may even be a characteristic of a resilient community, and suggests potential usefulness as a concept in Disaster Risk Reduction (DRR) efforts.

It appears through reading psychological literature and research into PMT and protection motivation that there is grounding for using it as an indicator or variable in the assessment of vulnerability in urban communities. This study would support this, both in contexts where flood-frequency is high and low. However, one of the shortcomings of the concept is in not knowing to what extent a person's protection motivation will actually result in protective responses. This will be especially true in contexts with a low-flood frequency and high involvement of government authorities in flood protection.

In these situations the question might arise over 'what is the difference between risk perception studies and protection motivation studies?' both could be seen to be limited in their ability to provide actual input on behaviour (Bubeck et al., 2012). Both risk perceptions and protection motivation at their cores can only provide likelihoods of behaviour, as such protection motivation may not as a concept on it own be useful in providing any more solid (valid & reliable) approximation of how people are preparing for future floods, or are able to react during a flood. Protection Motivation Theory (PMT), however, does provide a somewhat more structured and concise background that gives insight into how people are not only perceiving flood risks, but also how they are (if they are) thinking about responding to them. What's more the inclusion of non-protective responses and their influences on cognitive processes and protection motivation help breakdown understanding around behavioural responses or the absence of behavioural responses into clearer components and factors that can be influenced to help promote protective responses. Alternatively, assurances (from government or other organisations) that comfort people can be used to promote non-protective responses or non-problem focused coping (Carver & Connor-smith, 2010) to calm people.

Issues around contextual specificity and uniqueness may limit the extent to which protection motivation's use as a universal vulnerability indicator or variable may be applicable between case contexts. However, within case contexts comparison of protection motivation of different community groups will add depth and indication of which vulnerable households are likely to prepare and which not. However, dealing at an individual or household scale might present a research need that requires large financial and human resources, making such studies unfeasible. What's more PMT studies to date have taken more deductive approaches and have utilised survey instruments predominantly designed to test for relationships between the components of the theory. There is a need, therefore, for an survey tool or kit that enables risk managers, researchers, NGOs, government agents, to assess protection motivation more directly and succinctly, as well as providing outputs that enable them to incorporate the implications the concept provide into management and planning endeavours.

In using protection motivation as an indicator or variable of vulnerability, it is proposed that it should be done relative to the view of vulnerability as being the potential for loss (DHA, 1992; Cutter, 1996). Within this understanding of vulnerability, protection motivation provides a link between potential damage (loss) and actual damage. This is in fitting with Grothmann & Reusswig's (2006) view of vulnerability and the influence of responses on actual flood damages (Figure 2.1). Figure D.1 (Appendix D) presents a suggested format to how different levels of protection motivation link to different behavioural responses, and through these influence actual damage. It is recognised by Figure D.1 that events do occur that surpass the coping ability of communities, and as such the effects on actual damage are considered to occur within an event that is manageable to communities. Alternatively, protection motivation can be used in the monitoring of people's intent to prepare, and future research carried out to assess how this changes in responses to changes in their environment, and/or in the disaster cycle itself. Monitoring changes in protection motivation enables risk programs to understand the impact their campaigns and programs are having, to identify when tedium and disinterest

has arisen and respond accordingly, to compare which communities are perceiving what, and to assess the needs of communities in terms of resources and information.

Chapter 7 Conclusions, Recommendations & Further Research

This thesis has presented the findings of an exploration of the motivation people in Wilhelmsburg and Badda have to prepare for future floods. It has worked under the aim of increasing understanding around urban residents' flood preparedness behaviour, or lack of it, relative to the qualitative application of Protection Motivation Theory (PMT) in two contrasting urban communities. The following chapter concludes this thesis with brief discussions on:

1. Conclusions to the research questions;
2. The limitations of this research; and
3. Recommendations from this research for future research[63].

7.1 Conclusions to the research questions & reflections on the knowledge contributions from a qualitative approach

Three research questions have guided this exploration, these questions have resulted in several significant conclusions.

7.1.1 RQ 1: *How are SOI concerning flood risk affecting how these urban communities describe floods and what worries them about flooding?*

Conclusions specific to the case sites

Wilhelmsburg

- SOI in Wilhelmsburg represent the chief means by which awareness around flood risk on the island is maintained, and amongst certain communities created.
- The main forms of risk communication involve memoria and indirect experience, and have resulted in:
  - Making flood risk a historical aspect of life on the island, diminishing its relevance to present day concerns.

[63] Mitigation recommendation for the different cases is available in Appendix D, Section D.4

  - Helping to establish faith and confidence in the public defence structures (dikes) and plans, which has reduced the need residents feel to investigate or undertake any personal preparedness actions.
  - Reducing perception of risk and the need to undertake an appraisal of coping ability and options.
- Established (cultural) senses of safety around flooding on the island are reducing any worry residents have concerning flooding and causing current risk messages (e.g. Sturmflut pamphlet, bus stops) to:
  - Be interpreted as assurances of safety, and there is no need to be aware and prepared, and/or
  - To become tedious and uninteresting, resulting in the topic of flood risk being perceived with equal disinterest.
- Information concerning future threats relating to climate change (e.g. sea level rises) and geomorphological alterations to the Elbe estuary due to dredging and harbor activities, have the ability to worry residents, however, are currently being responded to by non-protective responses.

Badda

- SOI in Badda do not depend on input from the government, although selected aid organisations (NGOs) are sources of help and information that urban-poor residents may trust.
- Prior experience with flooding is the chief form of information and awareness building in Badda, this has the affect of:
  - Generating active risk perceptions and coping strategies.
  - Developing a culture of flooding and disaster that has the characteristics of:
    - Being passed on from mother to child (generation to generation);
    - Establishing strategic tools and defence strategies that have multiple uses in and out of flood seasons;
    - An awareness of personal reliance, and need to persevere and fight (resilience);
    - Give personal encouragement and sense of self-worth to survivors.

Conclusions [potentially] universally relevant

- SOIs are important variables in influencing the flood risk perceptions, perceptions of coping ability and need, and non-protection and protective responses of flood vulnerable urban communities.
- Receipt and interpretation of the different forms of information (community, organisational, media, memoria etc.) will vary between communities and community members, based on aspects such as:
  - Degree to which the state has taken over flood defence, and the level of public involvement in the establishment and development of these defences.
  - Intrapersonal variables such as gender, employment status, length of time lived in an area, prior experience.
  - Likelihood and potential severity of a future flood:
    - Either perceived from information sources or from personal experience.
- SOI carry innate cultural understandings and meanings that inform those who are within the culture about the flood risk and response options. The more that this is expressed within the physical environment and not present in the living memory of the society the less likely it is that that society will have an evolved flood culture that stands to provide them with extensive resilience against a flood event. Which means:
  - The less likely they are to have developed coping strategies;
  - The more likely they will need to rely on outside help to protect them prior, during and post an event.
- In contexts with little experience of flooding, risk messages connected to future risks like climate change stand to be effective in developing some interest in the topic and as such:
  - The degree of uncertainty expressed within them should be carefully managed.
  - Represent a potential means by which vulnerable communities can be encouraged to consider their preparedness behaviour.

- Prior experience has been found in this study to be one of the most influential variables in the perception of risk, coping ability and generation of protection motivation.

7.1.2 RQ 2: *How do these communities perceive their flood risk and their ability to cope with it?*

Conclusions specific to the case sites

Wilhelmsburg

- Threat appraisal involved perception of threat probability predominately and involved assessment of sources of safety, sources of concern and uncertainty.
- Lack of prior experience in the case site meant that threat severity was not assessed.
- Fear was not found to be an active variable in regards to the assessment of flood probability and severity, however, concerns in regards to future risks related to climate change, poor maintenance of dikes and other structural defences, and the impacts of the dredging of the Elbe, were found to be variables.
- Current flood probability was seen as being low, and there was little need to think about coping – yet:
    - A process termed ‘coping consciousness’ in this study was found to act as an intermediary between threat appraisal and coping appraisal and resulted in the use of non-protective responses.
- A strong self-efficacy was identified amongst communities in regards to their perceived personal ability to respond to a flood event.
    - However, very little actual awareness for the different impacts that may accompany a flood was identifiable.

Badda

- Threat appraisal involved perception of threat probability and severity:
    - Perception of threat probability was found to involve: ‘uncertainty’, ‘part of life’, and ‘changing conditions’.

  - Perception of threat severity involved strong elements of worry, fear and faith.
  - The changing conditions and uncertainty aspects of flood risk perception, were seen to involve an element of 'wishful thinking' that enable informants to reduce the fear they have concerning the occurrence of major floods.
- Prior experience with floods equips informants with clear understandings of what flood events entail and how they impact on their lives.
- Coping appraisal illustrated that urban-poor women do not have the luxury of asking the question 'do I need to think about coping' anymore, they carry the awareness 'I have to cope'.
- Several coping strategies and preparedness responses were identified in regards to specific impacts that can be expected during a flood.

Conclusions [potentially] universally relevant

- SOI, most especially prior experience, have the potential to encourage communities to think beyond threat probability and undertake personal coping appraisals:
  - If ineffective, communities in low-flood-frequency contexts are not likely to perceive the need to think about coping options and preparedness plans.
  - Where some awareness is created, but no or few opportunities to be encouraged to think directly of coping exist then communities may go as far as thinking about the need to cope (coping consciousness) and end up engaging non-protective responses to re-establish their sense of safety.
- The engagement of coping appraisal carries a high likelihood to result in protective responses – if only reading of emergency materials.
- Self-efficacy acts to give coping appraisal motivation through self-encouragement, however, also acts as a component of coping consciousness and has the potential to self-assure people and communities and re-establish their senses of security without requiring problem-focused coping responses.

7.1.3 RQ 3: *Can PMT and its compositional concepts, namely SOI, threat appraisal, coping appraisal, and responses, be used to explain differences in preparedness behaviours in urban communities at risk of future floods?*

In this study exploration of the compositional concept of PMT was able to:

- Determine that protection motivation was low amongst informants from Wilhelmsburg and high amongst informants from Badda.
- To suggest how SOI influenced how communities, from differing urban contexts and circumstances, perceived their risks relating to flooding, as well as their perceived ability to cope or need to cope.
- To find evidence that suggests that:
    - The processes of perceived threat probability, severity and fear are components of the concept (and cognitive mediating process) of threat appraisal;
    - The process of self-efficacy plays a role in coping appraisal, however, also acts within the intermediary process/concept of coping consciousness identified as limiting the engagement of coping appraisal in low-frequency contexts.
    - Coping consciousness has the potential to encourage the use of non-protective responses (denial, postponement etc.) over the engagement of coping appraisal.
    - The occurrence of coping appraisal carries a higher likelihood to result in protective responses.
- Determine that prior experience is an important intrapersonal SOI, whose affects on the other conceptual components of PMT (especially in high-flood-frequency contexts) cannot be disregarded, or conceptually itemized as impact on protection motivation directly.
- Confirm that reliance on public-flood defence, and/or reduced personal involvement in flood defence limits the risk perceptions and preparedness activities of communities in low-flood-frequency, high State involvement contexts.

It is, therefore, put forward that PMT can be used to explain differences in preparedness behaviours in urban communities, however:

- Continued development and investigation into the theory and its compositional concepts is required:
  - Across differing and varied contexts; and
  - Through differing and varied research methods;
- There is a need for survey kits and tools that enable risk managers, researchers or city planners to measure and monitor levels[64] of protection motivation in vulnerable urban settings.
  - Such a kit would enable these agents to not only utilize the levels of protection motivation in flood vulnerability or damage assessments, but provide indications of aspects that are influencing levels of protection motivation and establish more effective programs and initiatives to shift them towards protective responses (be these as drastic as undertaking structural changes to homes, or as simple as maintaining a emergency kit in one's home and for one's family).
- From a more sociological view, SOI all add to the local meaning systems that social groups ascribe to the topic of flooding and flood defence. This adds to the constructed view and understanding individuals have of the topic. In this way the ultimate generation of protection motivation is ascribable to a cultural attribute, and potentially represents a characteristic of resilient communities.

In summary, it is concluded by this study that the concept of protection motivation is a concept that has both psychological and sociological (anthropological) attributes. As such its links with both the social system and individual cognitive processes provides insight into the different factors and reasons that influence the preparedness behaviour of urban communities. All in all, there is still lots to be explored, described and deduced from PMT and protection motivation, however, this study would suggest that it does add to our

[64] No unit of analysis is offered here, only the suggestion that variations in strength can be explored.

understanding of why some act and others do not. How it does, is a research endeavour that has only just been touched upon, and there is wide scope for future research into this question.

7.1.4 Knowledge Contributions from the qualitative exploration of PMT

The use of a qualitative research approach was explicitly selected to provide a means to explore with more depth the social phenomenon of why some prepare and others do not, through the concepts and processes described in PMT. In doing so this research contributed to the theoretical development of PMT and to its practical development within the flood contexts. The key outcomes of this research have been listed in the previous sections, and provide demonstration of the value of doing qualitative research to expand and elaborate on behavioural theories. The following points highlight the key aspects that a qualitative research approach provided to this study:

- The direct interaction with informants enabled a more intimate and locally grounded analysis. In being so:
  - Analytical points were not stripped away from their relationship with their context, and as such more detailed exploration of variables involved in influencing informants' perceived risks and coping ability could be achieved.
  - The similarities and contrasts between the responses of informants in the two cases and levels of flood experience could be more completely identified and described.
  - Aspects related to urban life and flood-risk perception & preparedness could be more directly identified.
  - The role of experience in influencing how people think, and act in flood-vulnerable settings could be identified more clearly.
  - The significance of the reliance informants' have on the State or City for protection in influencing their cognitive mediating process could be more directly explored and unpacked.

- The ability to breakdown established theoretical boundaries during the analysis of informants' responses [and their contexts] enabled the concepts and processes of PMT to be unpacked and elaborated on, as such:
  - More detailed complexities associated with the components of the appraisal processes were identified. The analysis was able to suggest structure to the threat appraisal process and concept (Figure 6.1) that has not previously been put forward.
  - It was able to begin to identify the variation in the use and emphasis on perceived probability and severity by informants relative to the degree by which they themselves were able to place themselves within the picture of a flood.
  - It has raised a question around the significance of perceived severity within the threat appraisal process. Most specifically among people with low-flood experience that tend not to have considered the severity to themselves, if at all, and as such do not appear to use past severity to the degree put forward in the literature to date.
  - It provides indication of the variables people utilize when developing perception around flood probability (i.e. sources of safety, sources of concern and uncertainty).
  - There is indication that there may be additional cognitive steps that people engage between threat appraisal and coping appraisal – here the idea of coping consciousness has been introduced.

Qualitative research methods and approaches have often faced problems with acceptance (Kohlbacher, 2006). However, it can be argued that there is a value to qualitative research that is not in opposition to the principles and philosophies of quantitative research, instead it complements and enables expansion and elaboration of scientific theories and thinking. It provides a means by which more contextually and case-specific knowledge can be utilized to explore, interpret, explain, and describe real-life social issues and phenomenon from real-life social perspectives.

7.2 Limitations of study

Certain limitations are inherent to this mode of research. Two areas are: Methodological limitations and Researcher limitations.

7.2.1 Methodological limitations

The informants of the study made up a non-random convenience sample from within the general populations in the different case sites, this has the effect of limiting the author's ability to generalize about the public at large. As much as possible this study has kept its findings specific to the informants interviewed, making more general remarks about 'residents', 'people' and 'communities' where theory discussed within this study is believed to stretch beyond the view of the informants themselves. It is not uncommon for qualitative studies to rely on smaller sample sizes as their analysis techniques do not require the use of statistical significances. However, several difficulties prevented a more representative group of informants from being included in the study these difficulties included:

1. Finding willing informants (as in Wilhelmsburg);
2. Getting to and accessing informants (as in Dhaka City); or
3. Being prevented from talking to selected types of informants due to safety issues (as in the case of men in Dhaka City).

Although successful in recruiting informants from a variety of ethnic groups in Wilhelmsburg, the lack of immigrant groups is seen as a potential limitation against generalising the results across the population of the whole island. In Dhaka, the lack of access to informants from varying income groups was seen as a limitation as the lack of research around high-income groups' experiences and perceptions of flooding prevents assertions about the protection motivation of these groups. In this regard external validity is considered limited in that the findings cannot be generalised to the entire of Wilhelmsburg or Dhaka City, or other flood-prone contexts.

Qualitative research and the use of in-depth, semi-structured interviews are also seen as limited in their use of self-reported data. Self-reported data is limited by

difficulties in independent verification, and the inclusion of sources of bias. Table 7.1 lists sources of bias and a description of how they may have occurred in this study. Although, this research was specifically concerned with the perceptions of informants, and their points of view, it is acknowledged that the presence of the interviewer may have affected the informants in Badda. This is considered less of an issue in Wilhelmsburg. In Dhaka Europeans have the impression of wealth, ability to provide aid, and novelty (in that they are often Caucasian and as such stick out as being different ethnically), this of course was not an issue in Wilhelmsburg.

Table 7.1 Sources of bias in the self-reported data used in this study

Sources of bias	Description of bias	Observations of bias in this study
Selective Memory	Remembering or not remembering experiences or events that occurred at some point in the past.	• Questions did not present the need for informants to be selective. • However, heuristic influences like accessibility, representativity and affect may have influenced which events, experiences or issues to express. Given this is an explorative study this was not considered a limitation of this study.
Telescoping	Recalling events that occurred at one time as if they occurred at another time	• Not observed in Wilhelmsburg informants; • In Dhaka when discussing different flood events, informants often discussed their experience as collective, not differentiating between different floods or times. In this way their experiences were made to look interchangeable between events, not necessarily specific to individual events.
Attribution	The act of attributing positive events and outcomes to one's own agency but attributing negative events and outcomes to external forces	• Observed in the manner that some informants in Wilhelmsburg responded to the flood scenario presented to them during the interview, and in regards to views on the actions of minority groups (e.g. immigrants, middle-eastern women, Bulgarians). • Observed by informants that described their ability to help during events in Badda.
Exaggeration	The act of representing outcomes or embellishing events as more significant than is actually suggested from other data	• Not observed in Wilhelmsburg informants. • Badda informants appeared to want the author to see they suffering, it was the impression of the author that there was a persistent attitude of 'you can help us' and attempts to impress on the interviewer (the author) the full extent of their suffering and difficulties.

In-depth, semi-structured interviews also have limitations associated with their reliance on the skills of the interviewer and data analyst, and the chances of possible bias they might introduce in the data collection and coding processes. Researcher limitations (interviewer) are discussed in the next section. The

need for interpreters during interviews had the affect of limiting the author's ability to follow and occasionally control the direction of the interview. The author sought to minimise these limitations by following the same protocol throughout the research process relative to each case site. This protocol involved:

- The preparation of informants through discussion of research aim, process and their protection (research ethics);
- The development of interview and discussion guides (that were as far as was possible piloted in the case sites);
- Through the development of data collection protocol around existing research approaches (Spradley, 1979 & 1980);
- Pre-training and discussion with interpreters;
- The use of post-interview translation and transcription by native language speakers;
- The use of coding and analysis protocols.

In this way, findings across informants from the same case site are considered comparable. These protocols have had the effect of enabling the author to have confidence in the trustworthiness of the results. However, in Badda the author had cause to doubt the interpretations of one of her interpreters. She realized that he was:

- Feeding answers he felt she wanted to informants;
- Getting overly annoyed with informants and telling them what to do; or
- Rephrasing questions so as to encourage informants to give what he perceived to be new and novel information.

Upon gaining evidence of one of these tactics (feeding of information to informants), the author hired other female interpreters with surveying experience. The first interpreter remained on the team, as an escort, however, played less of a role as an interpreter. The rephrasing of questions and the telling of informants what to say was identified during the editing of translated interview transcripts. The translator had been asked to translate both the interpreter and informants' responses in order to assess where changes in

meaning may have occurred, from these the author was able to assess the full extent to which the interpreter had been influencing the data; where necessary sections of data, or informants' responses were deemed biased by the interpreter, they were not included in the analysis.

Despite the smaller samples of informants, the in-depth interviews generated a large volume of transcribed data. The lack of other researchers available to provide additional input during the coding process is considered a limitation of this study. Where possible different interpretations of data have been provided and codes were both inductively and thematically applied, the first to allow themes to emerge naturally from the data, and the second to test the applicability of codes and interview excerpts to themes relative to the literature. However, the author acknowledges the potential bias of her subjective interpretations as a potential limitation.

Due to the time and resources required to undertake both case visits and analyze the research data, opportunity to get informants' views on research findings has been limited. The study has made use of peer-review (through presenting the data at conferences and project meetings with case partners) to assess the validity of the study. However, this process would have been more robust with the additional input of informants, as such this is considered a limitation of this study.

Lastly this is cross-sectional study, as such the findings of this thesis are restricted to views held by informants at the time of the interview. Resources were not available for additional site visits or interviews with informants; therefore, it is unknown how informants' perceptions of risk may have shifted since.

7.2.2 Researcher limitations

Table 7.2 presents a list with descriptions of how the author herself may have been a limitation in this study. In addition to the points listed in Table 7.2, the researcher has approached this research from the perspective that flood preparedness is a necessary process, as established from literature and

experience with the different communities. Adopting this perspective may have incorporated within the interpretations presented within this thesis, a negative view of those that are not preparing. This has not been the intention of the author, and she has attempted to proof-check against it, however, still acknowledges this may be a possible limitation.

Table 7.2 Researcher (the author) limitations.

Researcher limitations	Description of potential limitations
Access	• Access to certain informants in Badda was prevented due to safety and information integrity concerns. These concerns were due to the researcher's gender, sexual overtures during discussions with men in Badda made the researcher feel insecure and created concern over the type of responses male informants may provide. In addition, as a women and a Caucasian it was unsafe for the researcher to go to certain areas and move around the city at certain times (when strikes were on), this hampered the ability of the researcher to access other informants groups in the city. • Lack of ability to speak German may have put potential informants off participating in an interview.
Cultural & other types of bias	• Christian faith, South-African up-bringing, western perspectives. • Middle-income upbringing, postgraduate level education. • Positivist and mix-method ecological and geographical background and training. • Although, throughout this thesis and research process care has been taken to neutralise any bias or idiosyncrasies that the above cultural and life-event characteristics of the researcher may have created, it is acknowledged that much of the findings and discussion are the researcher's own interpretations of the data and analysis. As such any of the above points, or unidentified cultural attributes, may have influenced how a finding is presented or discussed. • This is an explorative study, so the researcher acknowledges that this has by and large been her exploration of this social phenomenon and use of PMT in the context of flooding and urban communities.
Fluency in language	The researcher is English speaking with little ability in German, and no ability in Bengali. As such it has been a limitation to this study in that interviews had to be carried out through an interpreter, certain documents and literature could not be accessed, and discourse use could not be included in the analysis.

7.3 Recommendations from the research

The social phenomenon of why some act to prepare for floods and others do not is one that will with increasing measure be of interest to people, research organisations, flood managers, and DRR practitioners. Although, it's clear that individuals are influenced by many different factors when assessing flood risk and response; increasing understanding about this and the nature of the factors and how they potentially influence people is an important avenue of future research. In this regard the following points make suggestions for potential

avenues of future research based on the experience and findings of this explorative case study.

- PMT is a useful method for the assessment of flood preparedness activities and intentions in flood-prone-urban communities. In this regard:
  - There is a need for a more standardized framework to be developed, which enables the precepts of the theory to be applied in risk management and risk reduction activities, across different contexts and cases.
  - Work done into looking at how PMT might be incorporated into other aspects of flood risk management and risk reduction (e.g. flood and damage modeling, risk communication, emergency planning).

- Different case sites are unique and the communities living within them often products of the factors and variables that make these sites unique. This study found 'SOI' to be an important group of influencing factors. These factors very often represent the links the site's context (social and physical) has with its inhabitants, and how risk communication is being propagated, interpreted and perceived. However, the use of them in many PMT studies is minimal. In this regard a recommendation is made for more research into the role of SOIs in PMT studies involving natural hazards.
- SOI provide the route through which more holistic views of risk perception production can be examined in flood-prone situations. They link social constructivist ideas of risk with psychological and geographical views, however, research into the development of understanding of how the different philosophies may be able to work together, and not clash over epistemological and ontological views, in order to create applied applications of the different theories held within the different schools is needed.

- The cognitive mediating processes of threat appraisal and coping appraisal and their links to protective responses through protection motivation is an area where much more research needs to be carried out.
  - Research is suggesting at the present that coping appraisal is an important aspect of protective responses, and that it has a greater influence than

threat appraisal. This study suggests that PMT is right in including both processes in understanding preparedness behaviour, and that there is a key relationship between threat appraisal and cognitive appraisal. Further research investigating this relationship is recommended.

- This study has identified that there might be an additional process that plays an intervening role between threat and coping appraisal, 'coping consciousness'. This needs to be deductively verified and explored with more depth and direction.

- Protection motivation as a concept is in need of more 'unpacking', description and definition. This study has found protection motivation to have properties of a cultural attribute as well as a psychological intervening variable; however, this idea requires further thought and research.
- There is potential that protection motivation can be used as an indicator for vulnerability assessments, specifically as it relates to damage potentials. As an indicator protection motivation can be utilized in monitoring:
  - Risk communication programs;
  - Risk awareness in flood-prone-urban communities;
  - Likelihoods of protective responses;
  - Potential shifts in damage estimates relative to mitigating programs.
- Protection motivation as a cultural attribute has the potential to add insight into the social production of risk, risk perception and risk response. As such further research into this concept as an outcome of sociological and anthropological processes is recommended.

- PMT's application within qualitative research is limited (Searle et al., 2000). It is suggested that there is scope for more qualitative studies where the various components, and the relationships between them, more specifically between them and protective responses, can be explored in more depth. It is believed based on the work done in this study, that such research can enhance understanding:
  - Around why people act or do not act to protect themselves;

- Around the usefulness of PMT in risk reduction activities and emergency planning;
- About how the components of PMT can be utilized in developing risk communication programs, and managing these in such a way as to ensure vulnerable communities are informed.

A question that the author has had in undertaking the Wilhelmsburg study, is should flood-vulnerable communities' lack of interest in a topic be something that protective agencies use as a reason for not seeing greater awareness in communities? Is not lack of interest, due to lack of experience and perceived risk, a research and management challenge? Most especially in the context of uncertainty about future events…

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Appendices

Appendices Figures, Tables & Boxes

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Appendix A: Chapters 2 & 3

A.1 Chapter 2 - Literature

A.1.1 Asian coping capacity case examples

Table A.1 Coping strategies of urban communities (Residents of wealthy villages, urban poor living in slums and squatter areas, and street children) in metro-Manila, Philippines (Zoleta-Nantes, 2002) (P1 = pre-flooding activities; P2 = during flood event activities; P3 = post-flooding activities).

	Community type:		
	Residents of wealthy villages (N=39)	***Urban poor in slums and squatter areas (N=39)***	***Street Children (N=10)***
	Flood Experience: Annual		
	Types of flooding: Surface runoff, tidal variations, monsoon rains, ground water hydrology, tropical storms (typhoons)		
Housing	**Economic:** • Spend P40 000 00 to P75 000 00 on filling materials to elevate their lots[(P3)]; • Sell their homes or buy a new house in a flood-free area[(P3)]. **Technological & Structural:** • Stay inside of house[(P1)]; • Planted trees[(P1)]; • Build second stories and/or add another floor or level to their dwelling structures[(P3)]; • Elevate the level of the first flood of their houses[(P3)].	**Technological & Structural:** • Strengthen house posts[(P1)].	**Social & organisational:** • Ride a *jeepney* and get off in a flood-free area to find a temporary sleeping quarter[(P2)]; • Hop on top of air conditioning units to keep warm and sleep there[(P2)]; • Stay for a night or two in the backyard of a flood-free apartment[(P2)].
Livelihood	**Economic:** • Work long hours to make up income loss[(P3)].	**Economic:** • Work extra houses if employment is available[(P2)]; • All household members engage in any form of employment[(P2)].	**Economic:** • Continue working, e.g. dust off the *jeepney* passengers' shoes even if one has a fever[(P2)]; • Collect a toll (coins) from anyone who crosses over their makeshift bridges[(P2)]; • Push flooded cars[(P2)].

	Community type:		
	Residents of wealthy villages (N=39)	***Urban poor in slums and squatter areas (N=39)***	***Street Children (N=10)***
	Flood Experience: Annual		
	Types of flooding: Surface runoff, tidal variations, monsoon rains, ground water hydrology, tropical storms (typhoons)		
Food & water	**Technological & Structural:** • Stock up on food[(P1)]; • Install and maintain pumps to draw off flood waters from their subdivisions to adjoining properties[(P1)].	**Economic:** • Cut down on food consumption and expenses on clothing, shelter and recreation[(P2)]. **Technological & Structural:** • Stocked up on canned goods[(P1)].	
Health/sanitation	**Economic:** • Installed efficient garbage collection and disposal systems[(P1)]. **Technological & Structural:** • Self-medicate[(P1)]; • Installed efficient garbage collection and disposal systems[(P1)]; • Maintain pumps to draw off flood waters from their subdivisions to adjoining properties[(P2)]. **Social & organisational:** • Move to nearby hotels for uninterrupted power and water supply[(P2)]; • Self-medicate[(P3)].	**Social & organisational:** • Be extra careful so as not to be wounded by concealed sharp objects[(P2)]; • Avoid being electrocuted by exposed live wires[(P2)]; • Self-medicate and buy over-the-counter medication[(P2)].	**Economic:** • Buy cold, diarrhoea and fever medications from convenient stores[(P2)]. **Social & organisational:** • Do not go to a clinic or see a doctor, simply let their fever or other sicknesses pass away[(P2)]; • Wash one's body and clothes on flooded streets[(P2)]; • Dry clothes by facing air conditioning units in the back of most buildings[(P2)].

	Community type:		
	Residents of wealthy villages (N=39)	***Urban poor in slums and squatter areas (N=39)***	***Street Children (N=10)***
	Flood Experience: Annual		
	Types of flooding: Surface runoff, tidal variations, monsoon rains, ground water hydrology, tropical storms (typhoons)		
Safety of belongings	**Economic:** • Move furniture and appliances upstairs before rainy season[P1]; • Keep their refrigerators & furniture on wooden stilts[P1]; • Move treasure items to relatives' homes in elevated places[P1]; • Park their cars in higher areas [P1]. **Technological & Structural:** • Have extra sets of clothes and shoes in offices and schools[P1]. **Social & organisational:** • Move treasure items to relatives' homes in elevated places[P1].	**Technological & Structural:** • Pack things up before rainy season[P1].	•
Mobility	**Economic:** • Buy boats as emergency transportation vehicles[P1].	**Technological & Structural:** • Use wide planks of wood as rafts to transport themselves and their few possessions[P2]. **Social & organisational:** • Children stop going to school[P2].	**Technological & Structural:** • Build makeshift bridges between pavements of flooded alleys[P2].

	Community type:		
	Residents of wealthy villages (N=39)	***Urban poor in slums and squatter areas (N=39)***	***Street Children (N=10)***
	Flood Experience: Annual		
	Types of flooding: Surface runoff, tidal variations, monsoon rains, ground water hydrology, tropical storms (typhoons)		
Overall safety & information	**Technological & Structural:** • Prepare flash lights & other emergency tools[(P1)]; • Build flood walls around village[(P3)]. **Social & organisational:** • Pray[(P1)]; • Clean up[(P1)]; • Homeowners' association raised money to build flood walls around the village[(P3)].	**Technological & Structural:** • Stocked up on candles[(P1)]; • Use plastic water basins as buoys[(P2)]. **Social & organisational:** • Stay calm[(P1)]; • Pray[(P1)]; • Exercise perseverance[(P1)]; • Go to evacuation centres, if they are open[(P2)]; • Observe precautions on flooded streets to avoid open manholes[(P2)].	
Preparation actions	**Technological & Structural:** • Dispose of garbage properly; • Clean their drainage canals[(P1)].		
Access to resources	**Economic:** • Collect an additional monthly contribution for pump maintenance and operator's salary[(P2)]; • Get loans from office, bank, friends and relatives[(P3)]; • Use their savings to cover flood losses[(P3)].		**Social & organisational:** • Scavenge wood planks, big stones or hollow blocks[(P2)].

(Source: Zoleta-Nantes, 2002)

Table A.2 Coping strategies of urban households in Semarang City, Indonesia (Dewi, 2007) and urban slum dwellers in Indore, India (Stephens et al., 1995) (P1 = pre-flooding activities; P2 = during flood event activities; P3 = post-flooding activities)

	Community type	
	Semarang City, Indonesia - households	***Indian City of Indore – slum dwellers***
	Experience: Annual	
	Types of flooding: river floods, tidal flooding	
Warning system or signal		**Social & organisational:** • Water levels are watched and assess constantly and carefully, when floods threaten(P2).
Housing	**Technological & structural:** • Construction of house with the reinforced material(P1); • Building dikes in front of the house using sandbags(P1); • Cleaning the canal surrounding the house(P1); • Closing the door and windows properly to avoid water getting in(P2); • Secure house entrance to avoid debris getting into the house(P2); • Repairing important damage to the house(P3). **Social & organisational:** • Preparing temporary place at friend's or relatives' place(P1); • Cleaning the house by draining(P2); • Guarding the house to ensure safety of belongings(P2); • Cleaning the house and surroundings(P3); • Looking for an alternative place to move(P3).	**Technological & structural:** • Attach corrugated iron roofing with rocks not nails, for easy removal(P1); • Houses built of wood and mud plaster rather than mud brick(P1).
Livelihood	**Economic:** • Continue working(P2);	

	Community type	
	Semarang City, Indonesia - households	***Indian City of Indore – slum dwellers***
	Experience: Annual	
	Types of flooding: river floods, tidal flooding	
Food & water	**Economic:** • Purchasing cheap food[(P2)]. **Social & organisational:** • Storing basic food items such as rice and sugar[(P1)].	**Technological & structural:** • Storing grain in metal containers on high shelves[(P1)].
Safety of belongings	**Technological & structural:** • Repairing minor damage of the appliance[(P3)]. **Social & organisational:** • Preparing places for storage in higher places[(P1)]; • Taking important things to flood-free places (friends' or relatives' homes) [(P2)]; • Continue patrolling the neighbourhood (*ronda*) [(P3)].	**Technological & structural:** • High internal shelving[(P1)]; • Raised storage platforms[(P1)]; furniture more durable and resistant to immersion in water[(P1)]; • Ceiling platforms for valuables food & mattresses[(P1)]. **Social & organisational:** • Own trunks for carrying valuables away more easily should they need to[(P1)]; • Valuable possessions (electrical goods) moved to higher ground (severe floods) first, second lighter valuables and cooking utensils, finally clothes and mattresses[(P2)].
Overall safety & information	**Social & organisational:** • Ronda (patrol area neighbourhood[(P1)]; • Evacuating the family, especially children and elderly to safer places such as: factory buildings, *kelurahan* office (local building office), mosque, friend's or relative's place[(P2)].	**Technological & structural:** • Electric connections at head height[(P1)]. **Social & organisational:** • Wealthy residents, local (religious) welfare organisations, and local businesses may provide food, blankets, clothes and medicines[(P1)]; • People (elderly, children) move to higher ground (during severe floods) (before possessions) [(P2)].
Preparation actions	**Technological & structural:** • Do nothing[(P1)].	

	Community type	
	Semarang City, Indonesia - households	***Indian City of Indore – slum dwellers***
	Experience: Annual	
	Types of flooding: river floods, tidal flooding	
Access to resources	**Economic:** • Saving money[(P2)]. **Technological & structural:** • Searching for relief materials[(P2)]. **Social & organisational:** • Helping other community members in doing work (*gotong royong*)[(P3)].	**Social & organisational:** • Slum dwellers skilled in using the media and community leaders to press for state compensation[(P1)].

(Source: Stephens et al., 1995)

A.1.2 Manageability categories

Table A.3 Households' manageability categories and respective coping strategies.

Category	Description	Coping strategies

Normal	• Low flood levels – ankle depth (+/-30cm).
	• Lasting less then three days.
	• This stage does not embody high levels of direct physical threat, but because of its high recurrence it increases the exposure of people, particularly children, to water-borne diseases.
		• Adaptation strategies:
		  ○ Elevated houses and pathways;
		  ○ Help working people to carry on with their economic activities;
		• Students can attend school;
		• Generally people are able to continue with their 'normal life'.
		• During these flood stages people carefully follow the official warnings, and their coping mechanisms sustain their mobility while avoiding direct contact with floodwaters polluted with human and animal waste.

Manageable (disturbing)	• Flood stages below or slightly above knee depth (40-60 centimetres or 1-2 feet) and which lasts less than three days, • Or flooding at ankle depth but which lasts between three days and one week.	• By instigating some coping strategies at the family level, the situation is still found to be manageable. • The disturbance comes from the interruption of normal activities, schooling, for example, such that working parents have to allocate time from economic activities to take care of their young. • Disruptions to people's everyday activities represent extra stress in their already challenging daily lives. • Mobility difficulties arise as many roads and pathways are flooded and economic activities such as street vending and washing clothes, as well as the running of small 'in-house' shops and food stalls, have to cease. • This stage also represents a higher exposure to diseases among people who still commute to work or perform tasks such as collecting potable water, for they have to wade amidst stagnant waters.
Highly Disturbing (hardly manageable or intolerable)	• Flooding reaches below or slightly above waist depth (80-100 centimetres or approximately three feet) and lasts between one and three days, • Or when water levels are below or slightly above knee	• Mechanisms to counteract the negative effects of inundations are nearly depleted • The disturbance created usually exceeds the resilience of the most vulnerable groups - Their flimsy residences

	depth (40-60 centimetres or 1-2 feet) but last between three and seven days.	do not constitute a safe shelter anymore and most of their daily economic livelihood activities come to a halt. • The field studies found that this flood stage marks the boundary at which the poorest and more exposed families are forced to seek external physical protection and food assistance. • The first option for most families is to look for stronger buildings nearby to allow them to continue to protect their land plot. If neighbours cannot provide such assistance, people move to the homes of friends or relatives or to official evacuation centres in more remote areas. • Livelihoods and services. Flooding up to waist depth can cause severe damage to structures and poses a serious threat to the longer-term well being of the entire ward.
Unmanageable	• Flooding reaches around chest depth (130 centimetres or approximately four feet) in a single day and lasts a maximum of three days, • Or, when flooding reaches waist depth (80-100 centimetres or about three feet) but lasts between three days and one week, • Or, moderate magnitude flooding below knee depth (40-60 centimetres or 1-2 feet), which lasts for more than one week.	• The community asserts that it does not have the resources to manage or cope with the situation at this stage; most households have to rely on external assistance to meet basic needs, including drinking water, food, health care, sanitation and shelter. At this stage most people in low-lying areas have to leave their residence and move out of the ward; social and economic activities in the low-lying areas come to a stop and the community as such nearly disintegrates
Disastrous	• Flooding, regardless of the duration, reaches above chest depth (more than 130 centimetres or more than four feet), • Or when flood levels are below or slightly above waist depth (80-100 centimetres or approximately three feet) and last more than three days, • Or when floodwaters are below or slightly above hip depth (70-90 centimetres or around three feet) but accompanied by strong winds (that is, during a category four or five typhoon).	• In this case extreme mechanisms are adopted, such as family disintegration, migration (particularly of the head of household) to bigger cities, or simply remaining in a state of marginalisation and destitution for years, which becomes their 'lifestyle they are part of the collective memory.

(Source: Adapted from Peters-Guarin et al., 2012)

A.1.3 Twigg's (2004) classification of coping responses

Table A.4 Classifications of community coping strategies to natural hazards and disasters by Twigg (2004).

Coping type	Description	Examples
Economic/material coping strategies	• Principal element is economic diversification: • More then one source of income (or food).	• Rural households who can't engage in agriculture take up other work e.g. selling handicrafts, carpentry, building, blacksmithing, and fishing. • Many rural households depend on cash remittances from family members working in towns and cities. • Rickshaw drivers (Dhaka City), turn to day workers when water logging or floods due to monsoon rains inundate the streets.
	Vulnerable households store up 'buffer' supplies of food, grain, livestock, and cash to draw on in difficult times.	Eat food of poor quality or less food, and look for 'wild foods' (e.g. seeds, nuts, roots and berries) during times of food shortage.
	Sell assets in times of crisis. Invest in moveable assets.	Selling livelihood assets e.g. animals, tools, seeds for planting or land, a last resort.
Technological: • Purposes: ○ To control hazards (e.g. building embankments and dikes to protect against floods); ○ To protect private and public facilities (e.g. safe construction or strengthening of homes, public buildings and infrastructure; ○ To provide people with places of safety at times of disaster (e.g. flood and	• Management of land for food production: • Employ practices that reduce the risk of poor harvests by increasing the range of crops grown. • Traditional seed varieties are selected for drought or flood resistance, and for particular locations.	• Mixed cropping, intercropping, kitchen gardens. • Other crops kept in reserve to plant where others are ruined by floods. • Pesticides made from local plants applied to crops.
	Land use strategies	• Avoid flood or landslide-prone locations when building a home. • Keeping away from hazardous places at certain times of year e.g. not taking livestock to pasture up mountain valleys during spring floods. • To mitigate against erosion and flooding during monsoons, Nepalese villagers: ○ Convert hillsides into level terraces, ○ Create outlets to manage water overflow from one terrace into another, ○ Create networks of ponds to slow rainwater run-off and save it for the dry season, ○ Build stone-works and plant trees to stabilise slopes and

Coping type	Description	Examples
cyclone shelters).		prevent erosion of gullies.
	Adapted housing	• Houses built on stilts so that floodwaters can pass underneath. • Houses built on plinths or platforms of mud or concrete to keep them above flood levels. • Building escape areas either under or on top of the roof. • Building house from light-weight materials (that can be easily dismantled and moved) (Bangladesh). • Building false roofs where goods can be stored and people can live (Bangladesh). • Using beds as a living area when water enters the house (Bangladesh). • Hanging belongings from the roofs in jute nets (Bangladesh).
	Invest in moveable assets.	Animals and boats.
Social/organisational	• Indigenous organisations; • Kinship networks; • Mutual aid; • Self-help groups.	People suffering from food shortage could call upon kin, neighbours or patrons for help.
	Labour and food sharing during crisis.	Work parties (*mingas*) in are formed in certain indigenous communities in Latin America to rebuild after floods.
	Family the fundamental social unit for reducing risk.	• Extended kin networks provide avenues for exchange, mutual assistance and social contact. • Families living on chars (islands) in the Jemuna River (Bangladesh) try to marry their children into families on the mainland so they have somewhere to move to.
	May appeal to wider community for charity.	In many communities, gifts or alms are expected at times of trouble or hardship.
Cultural	• Risk perceptions: • Will vary between and within communities according to culture, experience, and pressure to secure livelihood. • Communities have unique ways of determining when conditions have shifted. • Religious views.	

(Source: Twigg, 2004)

A.1.4 Theoretical factors influencing risk perceptions

Table A.5 Summary of theoretical factors seen to affect the social perception of risk as it relates to hazards

Paradigm	Approach	Factors	Outcomes	References
Rationalist & positivist	• Engineering. • Revealed Preference.	• Voluntary vs. involuntary (are the risks voluntarily taken). • The immediacy of effect (how readily is the affect of the risk experienced). • Extent of personal knowledge of the risk. • Extent of scientific knowledge of the risk. • Chronic vs. catastrophic potential of the risk (chronic risk is one in which people are killed one at a time, and a catastrophic risk is one that kills a large number of people at once). • Common vs. dread (to what degree have people learnt to live with a risk and its effects). • Severity of consequences (how likely is it that a type of risk will have fatal effects). • Level of control people have concerning their exposure to the risk. • The newness of the risk.	• Voluntary risk perceived as more acceptable than involuntary risks; • Dread & novelty significant factors in exampling people's acceptance of risk.	• Starr, 1972; • Fischhoff et al., 1978; • Slovic, 2000
Rationalist & positivist	• Cognitive Psychology. • Psychometric paradigm.	• Representativeness. • Availability. • Anchoring & adjustment. • Affect (emotions).	• Errors in assessment and judgment of risk outcomes, caused by bias to cognitive information accessibility.	• Tversky & Kahneman, 1982; • Tversky & Kahneman, 1983; • Johnson & Tversky, 1983; • Finucane et al., 2000; • Slovic, 2010.

Paradigm	Approach	Factors	Outcomes	References
Rationalist & positivist	• Cognitive Psychology. • Heuristics & Bias.	• 'Group': • The social units an individual belongs to; • Influenced by the claims the social unit makes of its constituent members. • 'Grid': • The rules that regulate individual relational behaviour.	Four distinct worldviews or: • Individualistic; • Egalitarian; • Hierarchical; • Fatalistic.	• Douglas, 1978; • Douglas & Wildavsky, 1982.

Constructivist & qualitative	• Anthropology.
	• The Cultural Theory of Risk.
		• Culture:
		  ○ Attitudes;
		  ○ Beliefs;
		  ○ Knowledge.
		• Social Organisations:
		  ○ Family;
		  ○ Peers;
		  ○ Community;
		  ○ Governance.
		• Social Institutions:
		  ○ Economics;
		  ○ Policy;
		  ○ Science;
		  ○ Education;
		  ○ Media.
			• Risk is seen as a product of context.
			• Risk is socially meaningful and an understanding of it must be constructed from social factors.
				• Oliver-Smith, 1996;
				• Tierney, 1999;
				• Johnson et al., 2004

Constructivist & qualitative	• Sociology.	• Experience with risk object. • Information about risk object. • Signals processed and interpreted through stations (people). • Impacts of signal processing have a ripple-effect on the social perception of a risk.	• The generation of social signals of risk. • Risk amplified or attenuated in society. • Behavioural choices create secondary impacts which further amplify the risk.	Kasperson et al., 1988

A.1.5 Attitude-behaviour theories

Table A.6 Main attitude-behaviour theories, with key attributes or guiding questions or focus factors.

Theory	Theoretical beliefs	Key attributes & variables	Area of interest	Authors
Theory of Reasoned Action (TRA) & the Theory of Planned Behaviour (TPB)	People make behaviour choices based on the information and beliefs about behaviour choices they possess.	Three kinds of beliefs are identified in influencing behaviour reasoning: • ***Behavioural beliefs*** - beliefs about the positive or negative outcomes of an action - help in the development of attitude towards behaviour. • ***Normative beliefs*** - belief that action will be considered or viewed as relevant by important people or groups (i.e. perceived social pressure to engage or not engage in the behaviour) - leads to the production of perceived norms regarding engagement in certain behaviours. • ***Control beliefs*** - beliefs about personal and environmental factors that can help or impede their attempts to carry out the behaviour - develops into perceived behavioural control regarding different behaviours.		Fishbein & Ajzen, 2010; Fishbein & Ajzen, 1975; Ajzen, 1991
Person-relative-to-event (PrE)	• Concerned with the relationship between appraisal level of a person's resources & appraisal of seriousness of threat. • Predicts that a negative threat appeal resulting in appraisal of resources as being sufficient relative to degree of threat posed will generate more problem-focused coping than in the case where the appeal causes personal resources to be appraised as insufficient relative to the external threat. • Suggests the impact of negative threat	• Looked at effects of negative threat appeals in communications. • Incorporates both person and event variables. • Specifies a combinational rule with regards to how levels & mixes of levels of person & event variables combine in determining the persuasiveness of negative threat appeals. • Believes a causal relationship exists between the magnitude of appraised threat & magnitude of coping efforts.	• Earthquake preparedness; • Tornado preparedness	Mulilis & Duval, 1995, 1997; Duval & Mulilis, 1999.

Theory	Theoretical beliefs	Key attributes & variables	Area of interest	Authors
	appeals on behaviour is a function of the relationship between threat appraisal and coping appraisal and not any multiplicative, additive or sub additive combination of the absolute values of associated variables.			
Protective Action Decision Model (PADM)		Five questions: 1. Is there a real threat that I need to pay attention to? 2. So I need to take protective action? 3. What can I do to achieve protection? 4. What is the best method of protection? 5. Does protective action need to be taken now?	Flood preparedness	Perry et al., 1981; Lindell & Perry, 1992, 2000, 2004; Terpstra, 2009
Protection Motivation Theory (PMT)	Proposed that variables concerned with both the event (threat appraisal) & the person (coping appraisal) are critical in determining the motivation the person has to undertake protective action (communication persuasiveness).	• Looked at the effect of fear appeals on behaviour. • Threat appraisal: o The magnitude or potential severity of an event; o The probability of that event's occurrence. • Coping appraisal: o The perceived efficacy of a protective action for reducing the threat (response efficacy); o A person's perceived self-efficacy for performing the protective action (self efficacy); o The perceived costs and barriers associated with performing the protective action (response barriers)	• Heath behaviours; • Flood Preparedness	Rogers, 1975; Maddux & Rogers, 1983; Grothmann & Reusswig, 2006.

A.2 Chapter 3 – Methodology & Methods

A.2.1 Observations guide

	SPACE	OBJECT	ACT	ACTIVITY
SPACE	Can you describe in detail all the *places*?	What are all the ways space is organized by objects?	What are all the ways space is organized by acts?	What are all the ways space is organized by activities?
OBJECT	Where are objects located?	Can you describe in detail all the *objects*?	What are all the ways objects are used in acts?	What are all the ways objects are used in activities?
ACT	Where do acts occur?	How do acts incorporate the use of objects?	Can you describe in detail all the *acts*?	How are acts a part of activities?
ACTIVITY	What are all the places activities occur?	What are all the ways activities incorporate objects?	What are all the ways activities incorporate acts?	Can you describe in detail all the *activities*?
EVENT	What are all the places events occur?	What are all the ways events incorporate objects?	What are all the ways events incorporate acts?	What are all the ways events incorporate activities?
TIME	Where do time periods occur?	What are all the ways time affects objects?	How do acts fall into time periods?	How do activities fall into time periods?
ACTOR	Where do actors place themselves?	What are all the ways actors use objects?	What are all the ways actors use acts?	How are actors involved in activities?
GOAL	Where are goals sought and achieved?	What are all the ways goals involve use of objects?	What are all the ways goals involve acts?	What activities are goal seeking or linked to goals?
FEELING	Where do the various feeling states occur?	What feelings lead to the use of what objects?	What are all the ways feelings affect acts?	What are all the ways feelings affect activities?

EVENT	TIME	ACTOR	GOAL	FEELING
What are all the ways space is organized by events?	What spatial changes occur over time?	What are all the ways space is used by actors?	What are all the ways space is related to goals?	What places are associated with feelings?
What are all the ways that objects are used in events?	How are objects used at different times?	What are all the ways objects are used by actors?	How are objects used in seeking goals?	What are all the ways objects evoke feelings?
How are acts a part of events?	How do acts vary over time?	What are the ways acts are performed by actors?	What are all the ways acts are related to goals?	What are all the ways acts are linked to feelings?
What are all the ways activities are part of events?	How do activities vary at different times?	What are all the ways activities involve actors?	What are all the ways activities involve goals?	How do activities involve feelings?
Can you describe in detail all the *events*?	How do events occur over time? Is there any sequencing?	How do events involve the various actors?	How are events related to goals?	How do events involve feelings?
How do events fall into time periods?	Can you describe in detail all the *time periods*?	When are all the times actors are "on stage"?	How are goals related to time periods?	When are feelings evoked?
How are actors involved in events?	How do actors change over time or at different times?	Can you describe in detail all the *actors*?	Which actors are linked to which goals?	What are the feelings experienced by actors?
What are all the ways events are linked to goals?	Which goals are scheduled for which times?	How do the various goals affect the various actors?	Can you describe in detail all the goals?	What are all the ways goals evoke feelings?
What are all the ways feelings affect events?	How are feelings related to various time periods?	What are all the ways feelings involve actors?	What are the ways feelings influence goals?	Can you describe in detail all the *feelings*?

(Source Spradley, 1980)

Figure A.3 Observation guide taken from Spradley, 1980.

A.2.2 Interview guides & tools used in Wilhelmsburg, Hamburg

Box A.1 Wilhelmsburg: Residents Interview Guide; Italic sections are to help provide prompts or start-points of discussion (should informant exhibit inhibition, shyness or lack of direction) for the interviewer.

Italic sections are to help provide prompts or points of discussion to start at - for interviewer

Part 1 - Introduction and Context

1. What is your **gender**?
2. What **year were you born** in?

4. 3. Could you tell me a **little about yourself**?
   a. *What you do for a living.*
   b. Are you married, do you have children.

4. **How long** have you *lived/ worked* in Wilhelmsburg?

a. 3. Could you tell me **what it is like** *living/working* in Wilhelmsburg?
   a. *Tell me about the people, places (areas, buildings, businesses), community, culture, the environment (the river, the parks)*
   b. Tell me how the community relations, challenges, joys and concerns.

4. What do you enjoy most about *living/working* in Wilhelmsburg?
   a. *Do you feel connected to the community of Wilhelmsburg?*
   b. Do you and your family feel safe in Wilhelmsburg?
   i. Why?

5. Tell me about how it **has changed** since you first moved here.
   a. *What have been the major (most significant changes, in your opinion) changes/events/incidents.*

6. Tell me about your **current concerns** for Wilhelmsburg?
   a. *What do you see happening in the future?*

7. Do you seeing yourself staying in Wilhelmsburg?

Part 2 – Flood Awareness & Experience

1. 1. Could you tell me about what you know of the flood history in Wilhelmsburg?
   a. *Tell me when, what happened, what influenced it.*
   b. Tell me if you or any of your family involved?
   c. Tell me what you think about it?

2. Could you tell me about what you know about the current threat of flooding in Wilhelmsburg?
   a. *What are the causes of or reasons for this threat? (where does it come from, what is causing it, is it related to the river alone or are governance/power/situation variables compounding it).*

3. Do you feel you have access to information on the flood situation?

a. *Do you feel you need more information?*
b. Where would you seek information?
c. Tell me where have you received/obtained the information you do have from?

4. Tell me what the State/civil defence has done to prepare you for an emergency.
5. Do you feel that the State's flood protection measures for Wilhelmsburg are sufficient?
a. a. Yes – please tell me why you think this
b. b. No – please could you tell me why you think/feel this

6. Do you trust the plans and defences that the State has in place to protect you and your family from flooding?

Part 3 – Support & resources – Coping & Participation – Relationships

Scenario narrative coupled with inundation images
'It's late afternoon on a Thursday, people are just coming off work and returning home. Everything is as it normally is, and there are no obvious sign of trouble. You turn on your radio, when you get home, and you hear a storm surge warning not long after that the sirens start sounding and the loud speakers start calling out flood warnings.
Strong wings have caused this storm surge and rainfall in the North Sea [CLIMATE CHANGE] and the resulting surge of water down the Elbe surpasses anything on record. It soon becomes evident that the water is going to top the dikes and may even break through one of the dikes. Emergency warnings soon turn into evacuation warnings…Stages to consider: warning and event

1. 1. Tell me about some of the things you see taking place during a flood of Wilhelmsburg?
a. *Tell me about what you would do?*
b. Tell me about what your family or friends would do?
c. What would be your first priority?
d. Tell me about some of the things you think the community might organise/do?
e. Tell me about who you think would be the most affected [vulnerable]?
f. Tell me what you think the state/civil defence services would do?

2. Who do you think you would rely on most if a flood was to happen:
a. *Neighbours*
b. Friends
c. Family
d. State & Civil Defence
e. Yourself
*f. Other:*_____

3. What resources do you think are or may be limiting, that prevent the people of Wilhelmsburg from preparing for a flood?

Part 4 – Preparedness – Adaptation (Adaptive capacity)

a. 1. Tell me **about any precautions you have taken** to protect you and your family from flooding?

a. *Tell me what you and your family have done to protect your: house, livelihood, food, health/sanitation, safety of belongings, mobilisation, overall safety*
b. Do you consider yourself prepared?
c. Have you investigated your options in terms of taking out flood insurance?

2. Do you have an **emergency plan or evacuation plan** in case there is a flood?

3. Tell me how you believe people living in Wilhelmsburg can be better prepare for a flood?

A.2.3 Interview guides & tools used in Badda, Dhaka City

Box A.2 Badda: Residents Interview Guide; Italic sections are to help provide prompts or start-points of discussion (should informant exhibit inhibition, shyness or lack of direction) for the interviewer.

Part 1a – personal information

What is your name: _____

1. What is their gender? (Tick only one)

☐ Male ☐ Female

2. Into which age bracket do they fall? (Tick only one)

☐ 18-24 years	☐ 41-45 years	☐ 66-70 years
☐ 25-30 years	☐ 46-50 years	☐ 71-75 years
☐ 31-35 years	☐ 51-60 years	☐ 76-80 years
☐ 36-40 years	☐ 61-65 years	☐ 85 years +

3. What is their main occupation? (Tick only one)

☐ Employed ☐ Unemployed ☐ Retired ☐ House person ☐ Student

Other (please specify):

4. Number of people in household? (Tick only one)

☐ 1-3 ☐ 4-6 ☐ 7-10

Other (please specify):

5. Number of years lived in Badda? (Tick only one)

☐ All life	☐ 0-5 years	☐ 6-10 years
☐ 11-15 years	☐ 16-20 years	☐ 21-25 years
☐ 26-30 years	☐ 30-40 years	☐ 40 years +

6. Building Information

Sub-district		
Building-id (address)		
Building size (type)		
Building age		
Storey/floor lived on		
Ownership	Rent	Own

Building types: Hi rise (=/>7floors); Multi-storey (>1<6 floors); One-storey (houses with concrete roof); Semi pucca (brick walls & tin roof); Katcha (walls bamboo or other more temporary materials)

Part 1B - Living in Dhaka *[focus area]*[65]

1. Could you tell me a **about yourself**? [*Introduce self and give a little on different topics, attempting always to draw away from categorical or labelling (I.e. I am sharon I am a student, I come from here) and focusing on relational orientation (am I of two I have a brother and a mother who live in South Africa etc.*]
    a. *What do you for a living?*
    b. *Are you married, do you have children?*
    c. *Where do you come from if not here?*
    d. Can you describe what you do in a normal day in Badda*?*

2. How long have you *lived* in [*focus area*] Dhaka?

3. Please tell me about living in [*focus area*] Dhaka?
    a. *What is it like as a place to live?*
    b. *What are the people of Dhaka like?*

4. What do you **enjoy** most about *living/working* in Dhaka?
    a. *Do you feel connected to the community of Dhaka?*
    b. *Do you and your family feel **safe** in Dhaka?*
    Why?

5. In the time that you have lived in [focus area] Dhaka how has it **changed**?
    a. *Trends*
    b. *What have been the major (most significant changes, in your opinion) changes/events/incidents.*

6. What are your **concerns/worries** for [*focus area*] Dhaka?
    a. *What do you see happening in the **future**?*

7. Will you stay in Dhaka [*focus area*] into the future?

Part 2 - **Experience of Flooding in Badda**

1. When the monsoon season comes, I am sure that many things in your life have to change.
    a. How does **what you do in a normal day change,** during the monsoon season?
    b. What happens during the monsoon season (what does a monsoon look like)?
        i. *Where does the rain come from?*
        ii. How long does it rain for in a normal year?
        iii. Is there wind as well as rain? Is there thunder?
    c. What does you husband and family do during the monsoon season?
        i. *to keep working, and get around?*

Part 3 - Past flood experience (in a bad flood year – 1988, 1998, 2004, 2007)

1. I have some photos here that I have been gathering to try to understand what you have to live with and go through during a flood?

[65] Focus area = the area that the informant lives in.

a. a. Could you give me some insight as to what is really happening in the photos?
b. b. What do the pictures say to you?
c. c. How do you feel when you see these pictures [ask relative to different photo groups]?

2. Which flood do you remember best (1988, 1998, 2004, 2007)?

3. Why does this event stand out most to you?
a. *What made it a bad flood year [Why was it a bad flood year]?*
b. Did you get any warning that it would be a bad-flood year?

4. Could you tell me what happened during the flood in…?
a. ***Step by step*** *description?*
b. Was it caused by rain or river flooding?
c. When did happen, what time in the year?
d. How high did the water come?
e. Did it come in fast or did it rise slowly?
f. How long did it last?

4. Could **you tell me what you did during the flood in …**?
a. *What was your first priority, what was most important to do?*
b. How did you protect your belongings?
c. How did you keep yourself and your family healthy?
d. How did you protect your house?
e. Could you move around in the streets?
f. What did you do for food? How did you protect your food?
g. Did you evacuate?
i. What would have to happen for you to choose to leave/evacuate?

5. Could you **tell me what other people in your community had to do**?
a. *Did anyone in your family get hurt or sick?*
b. Were you and/or your husband able to continue working?
i. If not what did you do to make money?
c. How did you protect your belonging?
d. Were your children able to go to school?

6. Were you scared at any time?
i. What frightened you most?

7. Who did you rely on to help you most during the flood?
a. Did you get help from NGOs or government in anyway?

8. Could you tell me **what happened after the flood**?
a. What difficulties do you face after a flood?
b. What did you have to do to be able to return to normal?
c. How did the ***government or NGOs help*** *you after the flood?*

Part 4 - Flood preparedness

1. Can you **do anything to prepare for floods** in Badda?
   - *a. When do you start preparing?*
   - *b. What sort of things do you do to prepare?*
   - *c. Do you **consider yourself** prepared (ready)?*
     - *i. Why?*
   - *d. Do you feel safe from flooding?*

a. 2. Is there anything that you watch or listen to that tells you that the rains are starting and/or how bad the floods are going to be?
   - a. To help tell you when to prepare for flooding?
   - b. Or if it will be a bad-flood year?

3. I am **not a mother yet**, but I have a mother and I know that she has taught me many things about being safe in different situations.
   - a. Can you tell me what your mother **taught you about keeping safe** during floods?
   - **b. Can you tell me what you tell your children to keep them safe when the rains and floods come?**

Risk Perception

1. Would you say that **floods are part of life here in Dhaka**? – *Why*?
   - *1. Are they getting worse or better?*

2. Do you **feel you have any control over what happens** during a flood?

3. What is the thing **you fear worst** during a flood?

4. Is there anything you do, or that your family or neighbours do that **makes you feel safer** during a flood?

5. Can you tell me a few things **you think I would need** to survive floods in Badda?

6. Do you know of any stories or songs about floods in Bangladesh.

A.2.4 Ethical Considerations

Informed consent

All informants were asked to give informed consent prior to commencing an interview (or any other form of personal dialogue from which the information has the potential to be utilised in data analysis and research findings). This consent took place through a verbal description of the research purpose, and information requirements of the interview by the informant, in the informant's mother tongue (or language of fluency). In addition this description include the intended use of the information provided. Secondly, a subsequent written description was provided, which after reading the informant was given the opportunity to ask the researcher additional questions regarding the research and/or interview content and use there of. Upon indicated satisfaction by the participant that he/she/they had a full and complete understanding of the nature of the project, the participant was requested to sign a written consent form.

Deception

The research method and approach does not require any form of deception to facilitate informant response. As such all relevant information pertaining to the research was readily disclosed to informants prior to interviews.

Freedom of participation

This research is independent, and at all times refrained from developing a situation that might have been perceived to be otherwise associated or connected with local organisations or business in the selected areas. Such independence was protected in order to re-ensure informants of freedom of participation. Several steps were taken to ensure that at no time an informant felt coerced into participation, and that they fully understood that their involvement was voluntary. Steps included:

- From first contact (telephone or email) with informant a full description of the research purpose was provided, information on CORFU provided, information on connection to local partners provided, and connection to Cranfield University, and the informants made aware that there existed no obligation on their part to participate;
- Start of interview reiterated this information, and further explain the informant's freedom to participate and/or withdraw when indicated;
- Debriefing post interview included details on how to contact the chief research (Ms. Sharon Birkholz), how to get follow up on CORFU, and reminded participants of the 30-day period for them to withdraw their contribution.

Confidentiality & Anonymity

All information collected through the research process is considered confidential and has not been made freely available (in its raw form i.e. interview recording and/or transcriptions) to anyone outside of the chief researcher's research team

(translation support, transcription support). Members of this team were required to sign a confidentiality agreement pertaining to the information they had access to, and were carefully screened before being selected to be on the team.

Outside of the chief researcher informant identity has been kept anonymous. Informant identity wasbe recorded and known to the chief researcher, for clarification and report-back purposes, as well as allowing for the potential of an additional, follow-up interview (should it have been found necessary and the informant willing). Names are not revealed in the reporting of the study results.

Each transcript was assigned a interview number, which acted as its point of identification. No participant names were included in transcripts, and where necessary any individual mentioned by a participant during an interview was given a pseudonym in transcripts.

Protection from harm (including but not restricted to - physical, psychological, emotional, social, spiritual, career, reputational, financial or legal harm)

No physical harm of any sorts resulted from the research process. Care was taken in the communication around flood experience and risk perception as this was thought to potentially trigger emotional and/or psychological distress. Although the questions were not designed to specifically explore any emotional distress felt by informants, each informant left the interview with contact details for the local Civil Defence Office or disaster support agency (Bezirksamt Hamburg-Mitte for Hamburg & Food for the Hungry, Badda). The Civil Defence Office in Hamburg and Food for the Hungrey were approached prior to the study, and made aware of the CORFU Project, and representatives in each organisation identified in order to pass their details on to any informant seeking additional information post the interview (no informant requested this information).

All care, sympathy and where possible empathy was instilled in the interview process to reduce any possible anxiety caused by discussion around certain situations or questions. Participant response was carefully monitored and digested with the utmost sensitivity to their personal stress or distress and the interview process managed accordingly. In one interview in Badda, informants were discussing past difficulties experienced during the floods, and the informants became very emotion in their telling and began to cry. At the time the chief researcher indicted her sympathy and understanding and slowed the interview down, to allow the informants time to recover, she also shifted the direction of future questions so as not to cause the informants any further distress. Informants were asked if they would like to end the interview then, but indicated that they would like to keep going. No further incidents occurred.

Full confidentiality is ensured, however, there was and is no expected reason to believe that the information informants provided could in anyway be considered harmful to their professional or personal reputations. Participants were provided with details on how to withdraw post their interview, should they be or

become uncomfortable about anything they may have said or suggested - no informant exercised this right.

Observational intrusion

Observations took an experiential approach and involve personal interaction with local communities and civil defence or relief organisations. In general observations included tours through vulnerable areas in order to identify flood preparation by either individuals or local authorities. During these tours aspects of Spradley's (1980)[1] dimensions of descriptive observation, which include: space, objects, actors, activities, acts, events, time, goals and feelings, were observed and recorded in a written record (research journal) and photographs. Photographic observations, as much as possible avoided including any persons that had not given consent to the taking and use of the photograph. Where specific individuals, families, organisations, or government bodies were specifically observed, prior consent was obtained. Where observations included personal observations of communities, location dynamics, non-defined groups, care was taken during analysis not to utilise any information that might be perceived as discriminatory and unethical.

Data storage

Data has been recorded both digitally (via a voice recorder) and physically (via notes). All raw data has been dealt with in a confidential manner and stored in a similar manner. All data storage has conformed to current Data Protection Legislation in the UK.

Incentives or compensation for participants

All informants were approached to participate on a voluntary basis, with no incentive or compensation offered for their time or information. Small chocolates were given to informants as a 'thank you' for having participated, informants did not participate knowing that such gratitudes were coming and did so of their own accord.

Appendix B: Chapter 4

B.1 Context - Wilhelmsburg, Hamburg: an island with a future flood risk

B.1.1 Hamburg: a growing city

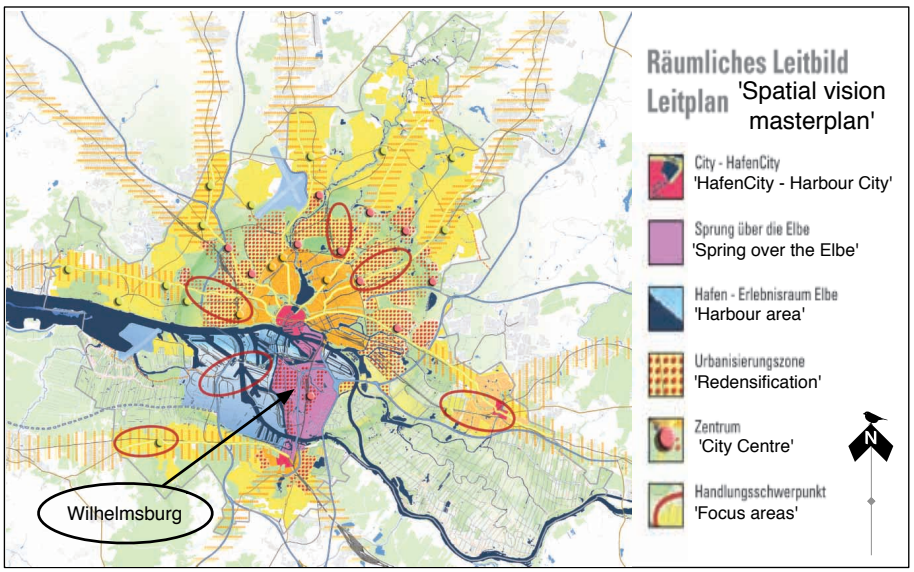
Located in the north of Germany on the banks of the River Elbe, the Free and Hanseatic City of Hamburg is the second-largest city in Germany, and sixth-largest city in the European Union (relative to population size which as of March 2012 was reported as being 1 802 041 people) (CityMayor Statistics, 2012). Hamburg's location near the mouth of the River Elbe (estuary) has enabled it to become the third largest port in Europe and the tenth largest worldwide; as such Hamburg is an important transport and trading hub in Northern Germany and between Germany and other parts of the world. With a GDP earnings of between 84 (2009) and 94 (2012) billion Euros, Hamburg has the largest GDP of all the German Federal States and is considered to be one of the most affluent cities in Europe (HWF, 2012). Its diverse and growing range of industrial sectors: manufacturing, trade, transport, food and hospitality, private and public sectors, real estate, entertainment, tourism and exports, have meant that it has a relatively low unemployment rate (8.2% in 2010 Hamburg-economy.de, n.d), and is very attractive to investors, business men and the working class. In 2012 HWF (Hamburgische Gesellschaft für Wirtschaftsförderung - Hamburg Business Development Corporation) stated that 236 000 foreign citizens from 179 countries live and work in Hamburg illustrating that the attraction of Hamburg is experienced both from within the German population and international communities.

With such accolades and achievements, Hamburg has the challenge to manage, sustain and grow within an unpredictable and currently weakened economy, as well as under increasing social challenges (e.g. the need for housing, education, social grants etc.) created by the influx of people into the city - most noticeably immigrants and asylum seekers. The city's development, growth and global standing is, therefore, a focal point for the city leaders and planners (BSU, 2006; BSU, 2007a; HWF, 2012). This importance is reflected in strategies such as '*Der Sprung über die Elb*e' (Leap over the Elbe) (BSU, 2006) and the Hamburg Senate's 'the growing City' strategy (BSU, 2007a; BSU, 2007b), in which the spatial visions of the city's leaders and planners reflects not only the city's need to grow, but to grow in such a way as to promote its high economic standing and 'quality of life' (BSU, 2007b). Box B.1 lists the key objectives of the Senate's 'growing city' concept, and Figure B.1 shows the focus areas for this 'spatial vision' for the city.

Box B.1 Key objectives of the Hamburg Senate's concept of the 'growing city' (BSU, 2077a & b).

- More city in the city:
  - Identify land in the city not being efficiently used, improve it in such a way that neighbourhoods where people can live and work are constructed.
- Building on qualities: a home in family-friendly Hamburg:
  - Demographic growth through urbanisation of new areas or redensification of existing areas;
  - Constant improvement of the quality of living for the residents of the City, by promoting use of green spaces and waterscapes;
  - Promotion of integrating activities and institutions i.e. schools, public initiatives or local institutions.
- Using Expertise - boosting the region's economy:
  - Constant economic growth and employment rate;
  - Strengthen the city's core growth industries' ability to drive business growth in the city.
- The Hamburg City experience:
  - Enhancement and improvement of the image of the City as a intercultural and international social space;
  - Develop key tourist sights that are key to the City's image.
- The metropolis is city and region:
  - Develop inter-federation ties with other German States.

As Box B.1 highlights, the 'growing city' initiative has identified several large objectives to develop by 2020. In achieving these objectives priority is placed on freeing up spaces in the city to create dwellings and workplaces (BSU, 2007b), and Hamburg's 'Leap [or Spring over] across the Elbe' represents the core of this objective. The 'Leap across the Elbe' project is focused on linking Hamburg city centre in the North with the southern districts of Wilhelmsburg and Harburg. In Wilhelmsburg this objective has been facilitated through the International Building Exhibition (IBA) and the International Garden Exhibition (IGS) (2006-2013) (BSU, 2007b), which showcased the strategies for dealing with the multifarious social and hazardous situations in Wilhelmsburg (Schmidt, 2012).



(Source: BSU, 2007a; own translations)

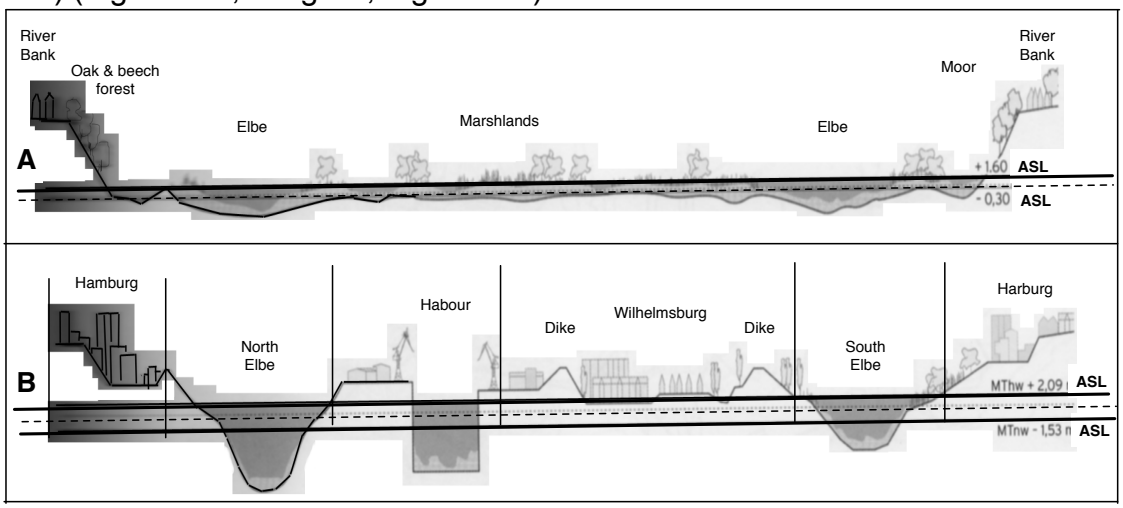
Figure B.1 The areas for applying the 'growing city' strategy in Hamburg.

Wilhelmsburg plays a key role in achieving the Senate's 'growing city' aims. As an island Wilhelmsburg is an intricate part of Hamburg's waterscapes, and as long as it can be defended from flooding an important land source and as such an important point for redevelopment and urban redensification.

B.1.2 Wilhelmsburg: From amphibious society to land-locked identities

The Elbe River, which could be considered largely responsible for enabling the City of Hamburg to become the vibrant economic and cultural hub it is today, is a major European river. With a total length of 1165km (Port of Hamburg, n.d) and transversing two countries the Elbe effectively links the Czech Republic with Germany and in essence through the harbour at Hamburg, the World. From its beginnings in the Krkonoše Mountains in the northern Czech Republic the river runs through Bohemia (Czech Republic) and meets the North Sea at Cuxhaven (Germany), some 110km (Loeper, 2009) downstream of Hamburg. Since 1842, about 870km (Port of Hamburg, n.d.) (dependent of political tensions and dynamics, e.g. political split between West and East Germany, as well as technological advances), as far as Prague, has been navigable by commercial vessels. At her mouth the Elbe is 15km wide, and has an average depth of 16.3m, which increases with high tide events (Port of Hamburg, n.d).

The Elbe estuary is historically the site of 'naturally' occurring marshlands that were inundated relative to daily tidal events (Figure B.2, image A). Since the early 1600s dikes have been used to enclose off areas of land, and enable land development and cultivation (Loeper, 2009). Over the decades the evolution of land development has resulted in the present day island of Wilhelmsburg. Wilhelmsburg is the largest (52km^2) Elbe-estuary island, and is considered to be the largest river island in Europe (BSU, 2007b; Gourbesville & Batica, 2011). It is situated south of the main centre of Hamburg, and is surrounded on the north by the Nordelbe (northern Elbe) and on the south by the Süderelbe (southern Elbe) (Figure B.2, image B; Figure B.3).



(Source: adapted from SUL, 2008)

Figure B.2 Topographical profiles of the Elbe estuary at Hamburg, A shows the natural, marshlands [historical] conditions; B shows the current profile.

The location of the district of Wilhelmsburg in the Elbe estuary gives the island an interesting riverine and maritime legacy. Such a legacy is intimately connected to water, and the dynamics of the aquatic system in which it has developed over the years. Indeed much anthropological research has looked at the 'amphibian societies' of northern Germany and the unique disaster cultures present historically within these societies (Kempe, 2007). Such culture is marked by deep memoria connected with the rising of tides and storm surge events (Kempe, 2007). Wilhelmsburg was the site of such a society, and this study has observed that remnants of the disaster culture that used to be present on the island are still evident in aspects of the current cultural memoria (see Section 4.2 for a description on 'Old Wilhelmsburgers', and Section 4.3 for discussion on the observational sources of information identified in Wilhelmsburg). Kempe (2007) describes how such 'amphibious societies' had developed specific adaptations to surviving in areas prone to regular flooding, and how such floods were part of the cultural memories that made up their lives. In addition, and interestingly, was the significance of the dikes to these people, and the role these flood defence structures played in politics and law, social acceptance, land ownership, and cultural traditions. Indeed without the dikes the areas in which these people lived would not be available for settlement and sustainment of livelihood. Therefore, the importance given to the dikes and their care was valid and those who did not take this seriously were not welcome, as this old Low-German adage reminds '*De inch will die ken, mutt wieken' ('He who does not want to build dikes, must go')* (Kempe, 2007, pp. 332). 'Dyking' the term given to the active building and maintaining of dikes in the region, would include most of the island's community (not just the land owners), and be a community event that not only reminded people of the imminent dangers posed by the river and the important role of the dikes in keeping them safe, but also serve as a social gathering that brought the community together in solidarity. As such the dikes have been an important component in the cultural landscape of the island (IBA-Hamburg, 2011). In Wilhelmsburg, the underlining ethos and principles of the Deichverband still operate around the responsibility and obligations of landowners to the dikes. Now, however, the Deichverband's statues also reflect the current need to reconnect residents of the island with the river, and include a requirement of the association to undertake flood awareness initiatives on the island and keep knowledge about the risk active. Table B.2 shows the statutes of the Deichverband.

The evolution of Wilhelmsburg's social landscape has been intimately connected with the Elbe and the community's ability to defend against her often temperamental nature. The diking of the Elbe's tidal floodplain for land reclamation and farming can be traced back to medieval times (Loeper, 2009), and as mentioned previously was populated by an 'amphibious' society adapted to the moods of life in the Elbe floodplain (Kempe, 2007). Over the years the dikes developed and extended, shifting the regime from small insular dwelling mounds (*Warften*) to four large islands (IBA-Hamburg, 2011; IBA-Hamburg, n.d.). In 1814 these four separate islands were enclosed in the main dike to form the large single island that exists today (SUL, 2008; IBA-Hamburg, 2011).

The height of the dikes has also grown over the years, from initial recorded heights of 3 m asl in 1600s, to heights ranging from 7.2 to 9.35m asl today (von Storch et al., 2008; IBA-Hamburg, 2011). Unfortunately as the isolated reclaimed mounds unified to form larger and larger tracks of land, and the technology available to keep the river from its natural pathways improved upon and the dikes heightened, the relationship between the river and the inhabitants of the island has been lost. So much so that current research done for the SAWA (Strategic Alliance for Integrated Water Management Actions) Project found that many residents on the island have minimal awareness of the role the dikes play in keeping Wilhelmsburg inhabitable (Nyberg et al., 2012; SAWA, 2007?). A sentiment reiterated by a representative of the IBA exhibition to the author regarding a survey the project did: "*So the office* [IBA] *asked the people here… 'where's the dike?' 'And where's the water?' 'And where is a nice place on the water?' And they* [residents of Wilhelmsburg] *said 'ahh we don't know', so we* [IBA] *believe that many people really don't know that they have dikes which are 9 metres high, because than the water is out of your view and so 'Ahh, there is nothing and wow we don't live on an island'."* (IBA informant, 2011, transcribed as spoken). It would appear that the island culture of the Elbeinsel has been watered down and slowly replaced with new socio-cultural perspectives that reflect more land-lock identities and perceptions.

B.1.3 Wilhelmsburg: a socially transitional space and '*not naturally good land to live on*'[66]

The island of Wilhelmsburg has played the stage to many social transitions, and historically important events. As a space it has moved from agricultural borderland, just outside the main map of Hamburg to modern exciting 'laboratory' for architectural and sustainability experiments and ideas (Chamberlain, 2012). From its roots as reclaimed land from the river, it has called for intense input on the part of its inhabitants and governors to make the land 'good' to live on. Be it through adaptation to an amphibious way of life, or gentrification initiatives designed to stimulate interest and investment in the area.

Up until 1937 the city of Harburg-Wilhelmsburg fell just outside of the State of Hamburg in the Free State of Prussia, however under the Greater Hamburg Act passed January 26, 1937 (*Gesetz über Groß-Hamburg ind anders Gebietsbereinigungen* - Law regarding Greater Hamburg and other territorial readjustments) by the Nationalist Socialist government, it was given to Hamburg. However, Chamberlain (2012) describes how the perspectives of Hamburg concerning the use of space and the people ['bodies'] associated with that space, were based on the historical views, that the marshland in the centre of the Elbe was for working, and the riverbanks (*Geestland*) for living. This meant that those '*bodies that live in a 'natural area for work' are labouring bodies, not living bodies*' (Chamberlain, 2012, pp. 30), and as such the people

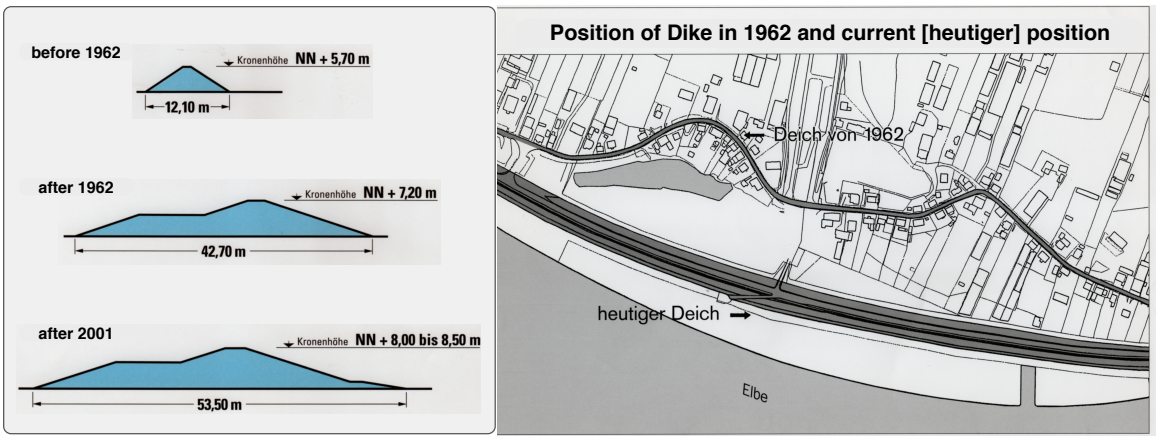
[66] Chamberlain, 2012, pp. 30

of Wilhelmsburg were seen as less than 'human', being of body but not property or character (Chamberlain, 2012). Ideally this meant that these bodies were present but not present at the same time, fulfilling their purposes in the factories and harbour and progressing industrial development, but owning no property of their own nor, ideally, permanence (i.e. would return to where they came from post labour responsibilities) (Chamberlain, 2012).

In the nineteen hundreds and early twentieth century Wilhelmsburg was home to harbour workers, men that most often came from migrant backgrounds (*Gastarbeiter*) (predominantly Turkish and Eastern European) to work in the ship yards and in the port. Although these men were brought in as 'cheap' labour and expected to return to their countries of origin post their service, many stayed and had families and grew roots (Chamberlain, 2012). Most of these families lived in the north west of the island in the built up area of Reiherstiegviertel (Figure 4.2), which sat on higher elevations than other parts of the island. During the 1920s the high costs associated with flood defence of the island, lead to Fritz Schmacher - the then director of Hamburg's building and urban development authority - to restrict residential development to the north of the Elbe (Loeper, 2009), and take focus away from maintenance and development of the Wilhelmsburg dikes. During the 1930s and 40s the National Socialist government instigated mass industrialisation of the island which lead to more labourers moving to live on it, these people slowly moved into more interior and low-lying areas of the island (Loeper, 2009). Old accommodation available to port and factory workers had to be extended as more workers arrived. Between 1943 and 1945 the Gestapo established a detention centre (*Arbeitserziehungslager* - work education camp) on the island with the objective of 'retaining' [slave] labourers who had been found breaking the rules, resisted or not met desired standards. Chamberlain (2012, pp. 33) provides this quote regarding the 'work education camp' on Wilhelmsburg, from an exhibit at the Neuengamme concentration camp (Konzentrationslager Gedenkstätte Neuengamme): '*These camps were often established in close collaboration with companies, because the management wanted to continue using the workers it had reported to the police after their imprisonment. By returning the tortured prisoners to the factories, the system of terror in place at the 'work education camps' was intended to also have a disciplinary effect on the entire workforce and especially non-German slave labourers*'. This camp was eventually destroyed in Allied bombing campaigns in 1945.

The south of the island was historically agricultural, populated with a few small villages (Kirchdorf) (Loeper, 2009). The residents in these areas most often had ancestral roots to the island, and came from families who had been working and farming on the island for several generations, as such they had an adapted way of life, which respected and understood the hazards associated with living behind dikes (Loeper, 2009). With the end of the Second World War in 1945, numerous homeless residents [from Hamburg] and many refugees [from other parts of Germany] sort refuge in Wilhelmsburg, where many of them ended up living in small 'garden houses' (sheds in garden plots) situated in the lower-lying areas of the island.

In the background, the dikes had remained ill maintained and on the 16th February 1962 the river breeched the dikes and inundated the island (and many other areas of Hamburg). This flood hit the island hard leaving its infrastructure in disrepair and its residents in shock (>300 dead and over 20 000 homeless). The 1962 flood, restored the city of Hamburg's awareness of the need to more actively be watching over its flood defence, and it took extensive steps to ensure that a catastrophe of that degree did not occur again. Massive investments were put into restructuring coastal defence in the area (von Storch et al., 2008). The dikes were restored, heightened and strengthened, and legislation regarding what could be done on them tightened to ensure that no activities (e.g. building on them, using them to grow vegetables etc.) that could cause them to weaken be carried out on them. Figure B.3 shows the changes made to the height of the dikes since 1962, and the repositioning of the dikes. The city also put together extensive emergency plans to ensure that adequate warning would be available to people on the island, and emergency support available to them as quickly as possible should a dike be breached. All these mitigation measures have proved to be highly effective, as demonstrated by the lack of impact by subsequent, larger storm surges (most notably 1976) (von Storch et al., 2008) (Figure B.4). However, although the flood did bring a reminder to the residents of the island of the risks living on an river island in an estuary bring, the effectiveness of the structural protection for flood control by the State and city lead to people transferring their reliance on the dikes to these agencies, and in effect transferring their sense of responsibility for maintenance of their flood defence to them as well (Knieling & Fellmer, 2013).



(Source: Amt für Wasserwirtschaft, 2001, own translations)

Figure B.3 Changes in dikes post 1962: left image shows increases in dike heights and sizes; right image shows the position of the dike in 1962 and the current position.

(Source: http://wwwdelivery.superstock.com/WI/223/1848/PreviewComp/SuperStock_1848R-521383.jpg)

Figure B.4 High tide marks for the 1962 and 1976 storm surge events at Teufelsbrück, Hamburg.

Although actions regarding the improvement of flood defence were swift, city authorities were unsure of what to do with the island, since 1961 the port expansion act had cast doubt on whether or not Wilhelmsburg would continue as a district at all (Schmidt, 2012). They consequently decided to designate the area for harbour and industrial use, and residents would get little assistance offered in rebuilding in order to encourage them to move to alternative areas in the city (Chamberlain, 2012), in essence Hamburg's urban development implemented a 'planning vacuum' for Wilhelmsburg (Schmidt, 2012). This vacuum led to long-term planning uncertainty around Wilhelmsburg and a sense of administrative isolation (Schmidt, 2012). In spite of the uncertainty as to what to do regarding the island by city authorities, many of the residents stayed and the cheap living costs on the island attracted more migrants, and other less wealthy residents. Left with little assistance from the city, the island population had to develop its own identity and ways in which the new residents could be integrated into this identity (Schmidt, 2012). Interestingly this new cultural development mirrored past development, with one significant difference, where once the river was the threat to life on the island, now social conditions and problems became the threat. Wilhelmsburg's isolation from Hamburg was no longer perceived through physical situation, it was now perceived through the opinions and actions of the rest of Hamburg as it tried to work out what to do with the island - Wilhelmsburg once more became land not 'good' to live on,

and in many regards was considered the city's backyard to dump its unwanted wastes, toxins and socially undesirables.

B.1.4 Wilhelmsburg: a leap over the Elbe onto 'prime real estate'?

In 2011 just over 50 000 people (Statistisches Amt für Hamburg und Schleswig-Holstein, 2011) were determined to be living on the island, a rich assortment of cultures and ethnicities have gathered and made homes in Hamburg's troublesome island district. Wilhelmsburg's working class [labourers] and mix-race social climate generated the reputation of it being a socially deprived area, with high rates of unemployment (10,7%), welfare recipients (4,5% of overall welfare recipients in Hamburg) and foreign residents (34% of Wilhelmburg's residents) (Gourbesville & Batica, 2011). The city's use of [Nieder] Georgswerder a suburb on the north east of the island (Figure 4.2) as a dumping site for Hamburg's waste and rubbish, has created ecological issues and the view that the island is environmentally toxic (Schmidt, 2012). In addition, the island is crossed by a main highway and railway network, and surrounded in the north and south west by port and harbour activities. All in all affecting the island through noise and odour pollution generated from the considerable heavy goods transport and commercial traffic (Schmidt, 2012). Wilhelmsburg's reputation has always been hazard based, however, now the hazard is not from the river, but from the people and environment on the island.

Its poor social, ecological and industrial reputation has limited the interaction between the island and other residents of Hamburg. Sentiments of this are still evident in local discourse, as identified in discussions had by the author with people living on the north bank of the Elbe. Statements such as "*Wilhelmsburg is a little Istanbul*", and "*We don't go to Wilhelmsburg*" (person comm with Hamburg residents, 2011), spoke to the opinions of other Hamburg residents for the island's social landscape. However, with the increasing numbers of people being attracted to Hamburg, residential space has become scarce, and Wilhelmsburg's prime position near the centre of the city makes for prime real estate. However, its 'prime real estate' is on land historically not seen as 'good' to live on, and enshrouded in socio-ecological stigma. As such the city has had to work hard at changing the reputation of the island and for the most part this has involved cleaning up after itself. As an important component of the 'growing city' vision, the 'Leap over the Elbe' scheme aims at making Wilhelmsburg an attractive district with a distinctive identity (Schmidt, 2012).

Hamburg's move to shift the reputation of Wilhelmsburg from hazardous dumping ground to desirable real estate introduces numerous challenges. The city's primary transformation instrument is the International Building Exhibition (*Internationale Bauausstellung, IBA*) (BSU, 2007b), which aimed at showcasing architectural and sustainability ideas through the building of several innovative homes and buildings. Coupled with this is its strategies for: improving the image of business and schools on the island (IBA-Hamburg, 2013a); refurbishing many of the old buildings in Reiherstiegviertel that had not been developed since 1962; and transforming historical remnants of war (e.g. the anti aircraft bunker in Reihersteig, Figure B.5) and ecological deterioration (e.g. the

landfill in Georgswerder, Figure B.6) into beacons of ecological and sustainability advancement and improvements (the 'energy bunker', Figure B.5 and 'energy Hill', Figure B.6) (IBA-Hamburg, 2013b; IBA-Hamburg, 2013c). Within the 'growing city' vision, Hamburg ultimately is set to build or refurbish homes for between 30 000 and 40 000 people by 2020, increasing the island's population by almost double (Schmidt, 2012).

(Source: IBA-Hamburg, 2013b; historical imaged: http://www.vju-hamburg.de/energiebunker/index.php?site=5&lang=en)

Figure B.5 Anti-aircraft bunker being transformed into the 'Energy Bunker' now a power plant using renewable forms of energy, with a large heat reservoir. This supplies the Reiherstieg district with climate-friendly heat, while feeding renewable power into the Hamburg distribution grid.

(Source: IBA-Hamburg, 2013c; Birkholz taken Oct 2011)

Figure B.6 Redevelopment of old landfill site in Georgewerder, Wilhelmsburg, in 2011 smoke could still be seen rising up from the area, now site of IBA's 'Energy Hill' and a source of renewable energy for 4000 homes.

Of course, years of perceived neglect and disregard have left many of the residents of Wilhelmsburg skeptical of the sudden attention and influx of investment from the city. The refurbishments of old buildings (long sort after, Twickel, 2011) have the consequence of causing rental rates to increase, which places strain on many of the island's residents who are in either low income employment or living on welfare. The gentrification of Wilhelmsburg has created much debate and tensions both within the island and outside of the island. Within the communities of Wilhelmsburg the old established Wilhelmsburgers can't help but hope that it will be a way of once more lifting the reputation of their home (personal comms. Kirchdorf residents, 2011). Those affected by the increasing rents and pressures on shifts in social class and standard of living (e.g. poor residents, immigrants) are angry at the city's initiatives that have the affect of pushing them out of the area. Figure B.7 shows some of the graffiti that was observed during visits to Wilhelmsburg in 2011, community sentiment is often observable in such public displays of opinion, and one didn't have to go far to see it broadcast in Reiherstieg. Protestors outside of Wilhelmsburg have ethical reasons for arguing against social engineering through gentrification for seemingly capitalistic reasons (NION, 2010). Whatever the righteousness of the plans, IBA was completed in 2013 and the jury is still out as to its full impact.

(Source: Birkholz taken Oct 2011)

Figure B.7 Example of some of the communities regard for IBA and the processes it represents.

What is of interest is that raising the socio-cultural profile of the island will bring more people to the island, as well as increase the value of land and property, and in so doing increase the potential for damage should another big flood event occur. What's more is that now the island is largely inhabited by new comers, and people who didn't experience the 1962 flood, and as mentioned above are dissociated from the river and its risks. As the dikes have heightened, people's view of the tidal nature of river has been increasingly blocked out, and with it their awareness of the potential risks, risks that are projected to increase in the near future (von Storch et al., 2008; Knieling & Fellmer, 2013).

Due to modifications of the topography of the Elbe estuary - from activities to reduce the impacts of storm surges and for the harbour - the frequency, and intensity of high storm surges has increased since the 1970s (von Storch et al., 2008). In addition, projections of potential sea level rises within climate change scenarios, all present a situation in which future storm surges could surpass the limits of structural defences like the dikes, increasing the risk to residents of the Elbe-insel (island) (Loeper, 2009; Knieling & Fellmer, 2013). Therefore, there is a growing requirement for the residents of the island to be adopting flood protective measures at a local level (Knieling & Fellmer, 2013). These measures may include structural defences to homes and property, or simply involve ensuring that oneself is aware of the emergency procedure should an event occur, this may include an emergency kit with medical and nutritional support for a set number of days, or simply knowing which bus stops are evacuation points. In some regards it appears that there is a need to re-establish a society with amphibious adaptations and high regard for the potential for disaster. This leaves one thinking that perhaps Wilhelmsburg is still not 'good' land to live on - most especially if you are now no longer part of an amphibious society or worse not even aware you live on an island.

B.1.5 Wilhelmsburg: Preparing for the next flood

Flood defence organisations & their roles

The flood of 1962 was a valuable reminder to the city of Hamburg, of the importance of active flood defence. Their actions since then have had a continued focus on developing and maintaining flood defence in the city, both structural and non-structural. Flood management is Hamburg is overseen by two main ministries, the Behörde für Inneres und Sport (BIS) (Ministry of Internal Affairs and Sport), who are responsible for emergency response and planning in the city, and the Behörde für Stadtentwicklung und Umwelt (BSU) (Ministry Urban Development and Environment), who are responsible for the long-term development and management of flood defence in the city (Figure B.8). These two ministries work through several different offices and programs to develop plans and processes for flood defence and preparedness, in regards to Wilhelmsburg these programs are implemented by three main agencies: Bezirkamt Hamburg-Mitte [*Borough of middle Hamburg*] (Figure B.9), the Hamburg Port Authority (HPA) and the Landesbetrieb Straßen, Brücken und Gewasser (LSBG) [*Agency of Roads, Bridges and Waters*] (Figure B.8). The Bezirkamt Hamburg-Mitte is responsible for monitoring weather conditions and storm surge predictions, developing and implementing emergency plans in case of a flood (e.g evacuation) and flood preparedness initiatives (e.g. evacuation-collection points, signage, emergency pamphlets and information). The HPA monitors and prepares the harbour areas, and the LSBG is mandated to undertake development, design, construction, maintenance and management of the structural defences (i.e. dikes).

During a high storm surge event, that has the capacity to compromise the flood defences of the island of Wilhelmsburg, emergency organisations such as the Technisches Hilfwerk (THW) [*Federal Agency for Technical Relief*], fire, police, and medical crews are employed to help facilitate evacuations and help the people of the island during an emergency. Box B.2 lists some of the other emergency organisations that are involved in emergency support.

Box B.2 Emergency response and assistance agents available to Wilhelmsburg in the event of a flood event.

German	English
• Feuerwehr: Berufsfeuerwehr & Freiwillige Feuerwehren	• fire department: professional & volunteer firefighters
• Arbeiter-Samariter-Bund (ASB)	• Workers' Samaritan Federation (ASB)
• Bezirksämter	• District Offices
• Polizei	• police
• Schutzpolizei	• Security or protection police
• Wasserschutzpolizei	• River (water protection) police
• Deutsche Lebensrettungsgesellschaft (DLRG)	• German Life Saving Society (DLRG)
• Deutsches Rotes Kreuz (DRK)	• German Red Cross (DRK)
• Johanniter-Unfall-Hilfe (JUH)	• St John's Ambulance Service (JUH)
• Malteser Hilfsdienst (MHD)	• Malteser International relief organisation (MHD)
• Hamburger Deichwacht	• Hamburg Deich watch
• Bundeswehr	• Army

• Bundesanstalt Technisches Hilfswerk (THW) • Fachbehörden	• Federal Agency for Technical Relief (THW) • Other specialized authorities

(Source: http://www.hamburg.de/hamburger-katastrophenschutz,page-7/)

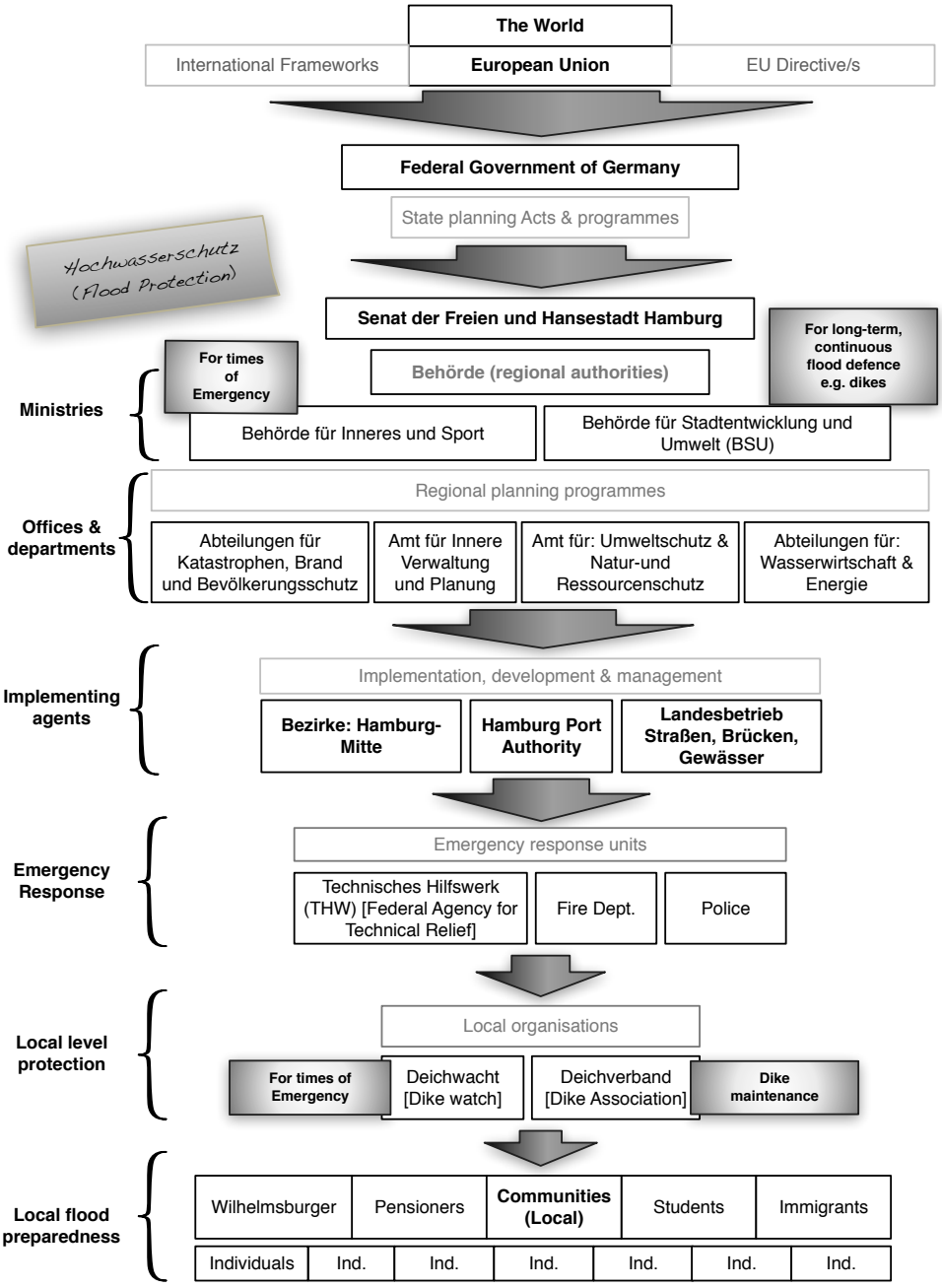
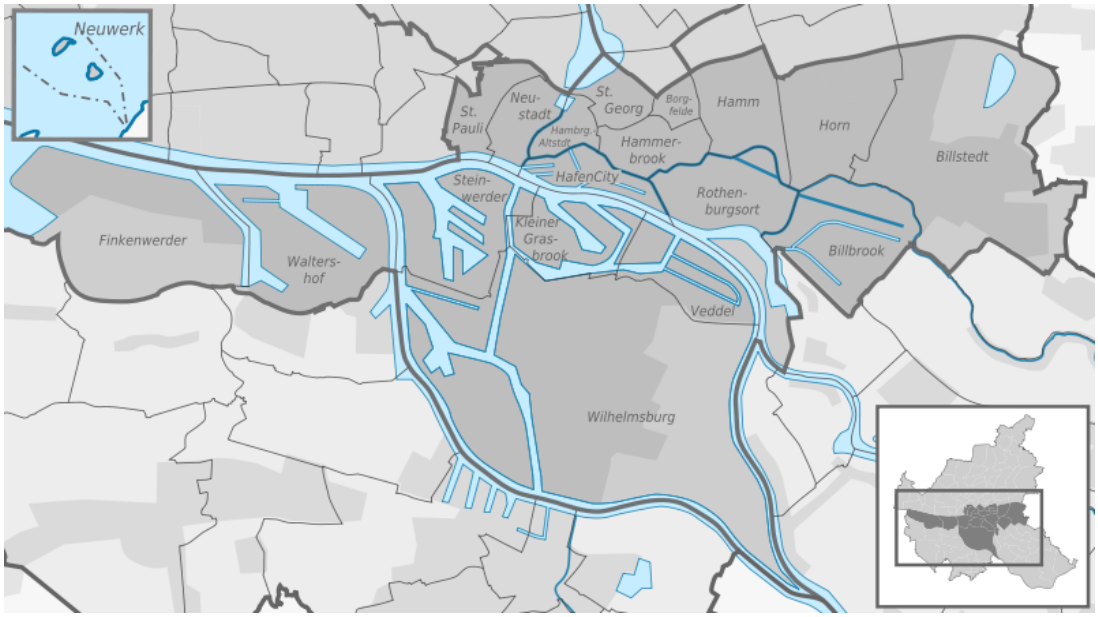


Figure B.8 Diagram of agencies responsible for flood defence and risk management in Hamburg, at the local level flood preparedness is reflected through individuals and communities in Wilhelmsburg.



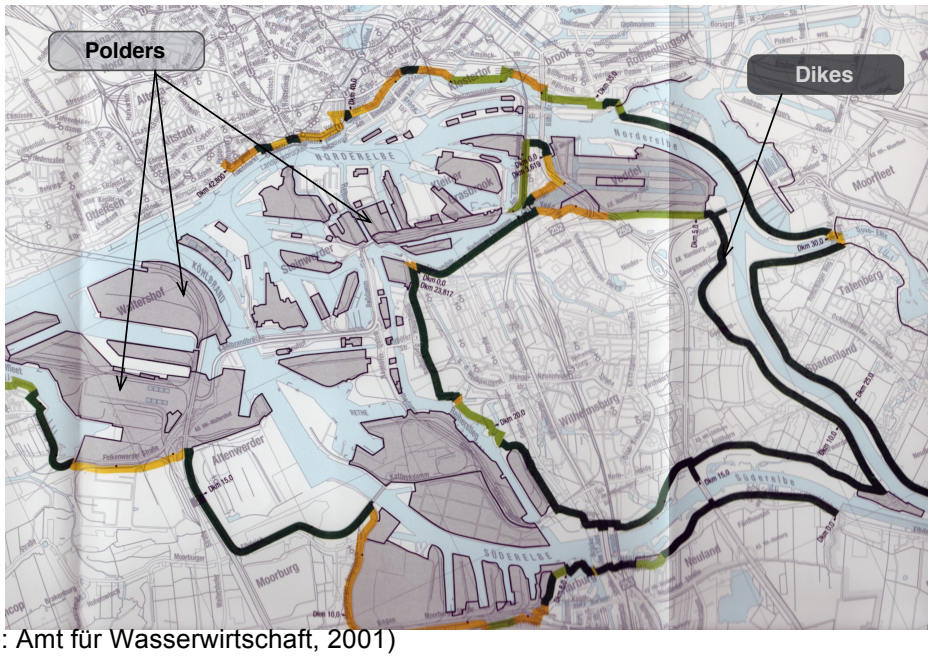
(Source: Wikipedia)

Figure B.9 Areas of Hamburg included in the Bezirk Hamburg-Mitte (*Borough of middle Hamburg*).

Dike defence and maintenance is also overseen by two local associations on Wilhelmsburg, the Deichwacht and the Deichverband. The Deichwacht or dike watch is made up of local volunteers who train to watch over and repair (where possible) the dikes during storm surge events. These men and women go to the dikes during these events to ensure the integrity of the dikes does not become compromised, and where holes and breeches occur they are trained to administer short-term repairs or implement alternative defences (e.g. sand bags) to help protect Wilhelmsburg from any form of inundation (booklet provided by informant involved in the Deichwacht, 2011, Figure B.14). The Deichverband or dike association, is automatically constituted by those who own land on Wilhelmsburg and, therefore, responsible for contributing to the flood preparedness and defence of the island (Table B.2). This association is currently focused on improving awareness of residents, and in generating personal interest in the topic of flood risk and protection on the island (Wasserland, 2007?).

Defence & preparedness strategies

Flood defence & preparedness strategies employ both structural and non-structural options. In terms of defence structures, the city utilises: polders, flood walls, flood gates, sluices, cascading flood compartments, flood proofing, deepening of the Elbe channel and dikes to protect its infrastructure and people. Wilhelmsburg's structural defence is solely reliant on its large ring dike that encircles the island (23.8km long). Figure B.10 shows a map of the polders in the harbour area and the dikes around Wilhelmsburg.



(Source: Amt für Wasserwirtschaft, 2001)

Figure B.10 Map of Hamburg harbour and Wilhelmsburg, showing the position of polders and dikes.

In terms of non-structural strategies, two main groups can be identified: preparedness initiatives and evacuation (during event) plans. The author inquired of a representative of the BIS as to what plans were in place to help support residents of Wilhelmsburg recover, and he suggested that although no formal plans exist, should a flood occur then help is guaranteed from the State for rebuilding. (Personal comms. Head of unit of Disasters and Civil Protection, Ministry of Internal Affairs and Sport, 2011). Evacuation plans, involve the logistical preparations required to warn residents and organise and manage their evacuation from the island, made especially complicated by having only four main roads off (Gourbesville & Batica, 2011). Warnings are dependent on available time between identification of a storm surge and its arrival in Hamburg. At most residents have 8 hours between a storm surge of above 3.5m asl at Cruxhaven being observed, at which time canons fire to give a warning followed by sirens once the flood levels have reach 7.3m asl, and the storm surge reaching Wilhelmsburg (Gourbesville & Batica, 2011). A storm surge at or above 7.3m asl is considered to be very dangerous and requires a full evacuation of the island. To reach residents radio, hot lines, teletext, television, and telephones are used to help ensure the message is transmitted throughout the island, and reaches vulnerable groups (e.g. the hospital, old age homes, schools.). Evacuation spots have been designated throughout the island at bus stops, which work as gathering and pick up points for the emergency transportation service, as the main roads will be closed during a storm surge event and people will not be able to leave via their own vehicles. Figure B.11 shows the evacuation and refuge spots on the island.

(Source: map IBA-Hamburg, 2011; photos Birkholz on field visit, 2011).

Figure B.11 Evacuation and refuge spots on the island (left); bus stops indicating collection points (Sammelpunkt bei Sturmflut) (right).

In terms of preparedness initiatives the BIS sends out an emergency pamphlet to all residents of the island in German, and makes it available in other languages, but these must be personally obtained from the Besirkamt (borough office). Figure B.15 (B.15 a & b German version, B.15c English version) shows a copy of this pamphlet. In addition to this pamphlet, BIS has published several brochures on storm surge protection, offers advice through its website (http://www.hamburg.de/katastrophenschutz/), and organises awareness events (e.g. Disaster protection day - inclusive of talks, simulations, and exercises), flood defence exercises and emergency training, and children's awareness events (e.g. Elvis und Bär unterwegs, Hochwasserschutz in Hamburg - Evis and Bear on the way: Flood protection in Hamburg) (Weichselgartner, 2008).

The growing awareness and concerns around climate change and future shifts in sea levels are well reflected in the numerous research projects that the city has been involved in (Table B.1 lists some of these research projects). These projects have looked at ways to continuously develop and improve on flood risk management strategies of the island and city relative to future climatic scenarios, conditions and impacts. Understanding that heightening the dikes any further in Wilhelmsburg has limitations means that the residents of the island must once more be taught to live with the river. This means that making people aware of the river, its dynamics, and the importance of the dikes in keeping it at bay is necessary. Several initiatives have been conceptualised to help achieve this.

Table B.1 Research projects that are or have been undertaken in Hamburg, concerned with flood risk management and defence.

Name of project	Funding source	Duration	Website
CRUE ERE-NET	European Commission (ERAC-CT-2004-515742)	2004-2009	http://www.crue-eranet.net/
Rimax (Risk management of extreme flood events)	German Federal Ministry of Education and Research (BMBF)	2005-2010	http://www.rimax-hochwasser.de
SAWA (Strategic Alliance for Integrated Water Management)	• European Union: European Regional Development Fund; • The Interreg IVB North Sea Region Programme.	2008-2011	http://www.sawa-project.eu/
XtremRISK	German Federal Ministry of Education and Research (BMBF)	2008-2012	http://www.xtremrisk.de/; http://www.tuhh.de/alt/wb/research/completed-projects/xtremrisk-e.html
Klimzug-nord	Central German government (€15m) & City of Hamburg (€1.2m)	2009-2014	http://klimzug-nord.de/
SMARTeST (Smart Resilience Technology, Systems and Tools)	European Commission: Seventh Framework programme	2010-2012	http://www.floodresilience.eu/index.php
MARE (Managing Adaptive Responses to changing flood risk)	The Interreg IVB North Sea Region Programme.	2010-2014	http://www.mare-project.eu/
CORFU (Collaborative Research on Flood Resilience in Urban areas)	European Commission: Seventh Framework programme	2010-2014	http://www.corfu7.eu/

The Deichpark (Dike park) is IBA's approach to reconnecting the residents of the island with the river around, it moves to promote the dikes and the space occupied by them as zones in which residents and visitors of the island can enjoy while learning about what the dikes are, what they do, and why they are necessary (IBA-Hamburg, 2011). Figure B.12 shows interactive pieces from the IBA dock where a learning exhibition has been set up to help inform people of the dikes and the role they have played in the creation of the island and continue to play in its protection, as well as introduce them to IBA's suggestions for the Deichpark.

(Source: Birkholz, visit to the IBA dock, 2011)

Figure B.12 Deichpark exhibition at the IBA Docks. Left top shows the miniature interactive dike and sheep (used to cut the grass of the dikes historically); bottom left shows the information boards for the exhibition, and right shows the brainstorming wall where people are invited to add keywords relative to their thoughts on the Deichpark.

Recreating an amphibious or water culture is the route the Deichverband is interested in adopting. This initiative is the brainchild of the organisation 'Wasserland' (*Water Country*) and their chief engineer Timm Ruben Geissler. This is a Hamburg-based organisation that is focused on developing sustainable prevention of flood damage, within the viewpoint of 'living with floods' (Wasserland, 2007?). They work at promoting a society that has a emotional bond with the water surrounding them (i.e. 'my waters/our waters'), in so doing the river and its water become part of the tangible and lived reality of the local population (Wasserland, 2007?). To facilitate this in Wilhelmsburg, three projects have been envisioned: the flood pillars, hydraulic playground and dike protection school. Figure B.13 presents the idea for the flood pillars, and how through showing the height of the river to people on the island, inhabitants are reconnected with what is happening behind the dikes.

(Source: Wasserland, 2007?)

Figure B.13 Flood pillars, designed to reflect the water level height in the river, so that inhabitants of Wilhelmsburg can be aware of what is happening behind the dikes.

Bringing awareness into the classroom is also a growing emphasis amongst this organisation (dike protection school) and other research projects. The SAWA (Strategic Alliance for Integrated Water Management Actions) Project implemented within an 8th grade class in Wilhelmsburg an initiative they called 'Dyke Defence Class' (SAWA, 2007?). Through this initiative the class worked through different aspects of 'dyking' and dike defence. These aspects were interdisciplinary and involved language, geography, history, science, and social sciences. Through them the children are encouraged to holistically explore and experiment around dike safety and efficiency. The program will next be opened to the other classes (grades 7 to 10), with facilitation help from the SchulungsZentrums für Deichsicherheit (training centre for dyke safety).

The city of Hamburg is doing much to work at making its waterscapes safe places to live and work, and on Wilhelmsburg there is definite evidence that there are people and organisations actively trying to bring home the message that a future flood may happen. While in Wilhelmsburg in September and October 2011 the author did not observe much evidence of all these initiatives on the island, and much of what is described above has come from literature and internet searches, as well as conversations with people directly involved in

these endeavours. Therefore, gaining more depth as to what residents on the ground are observing and thinking is important.

B.2 Deichverband's operating statutes

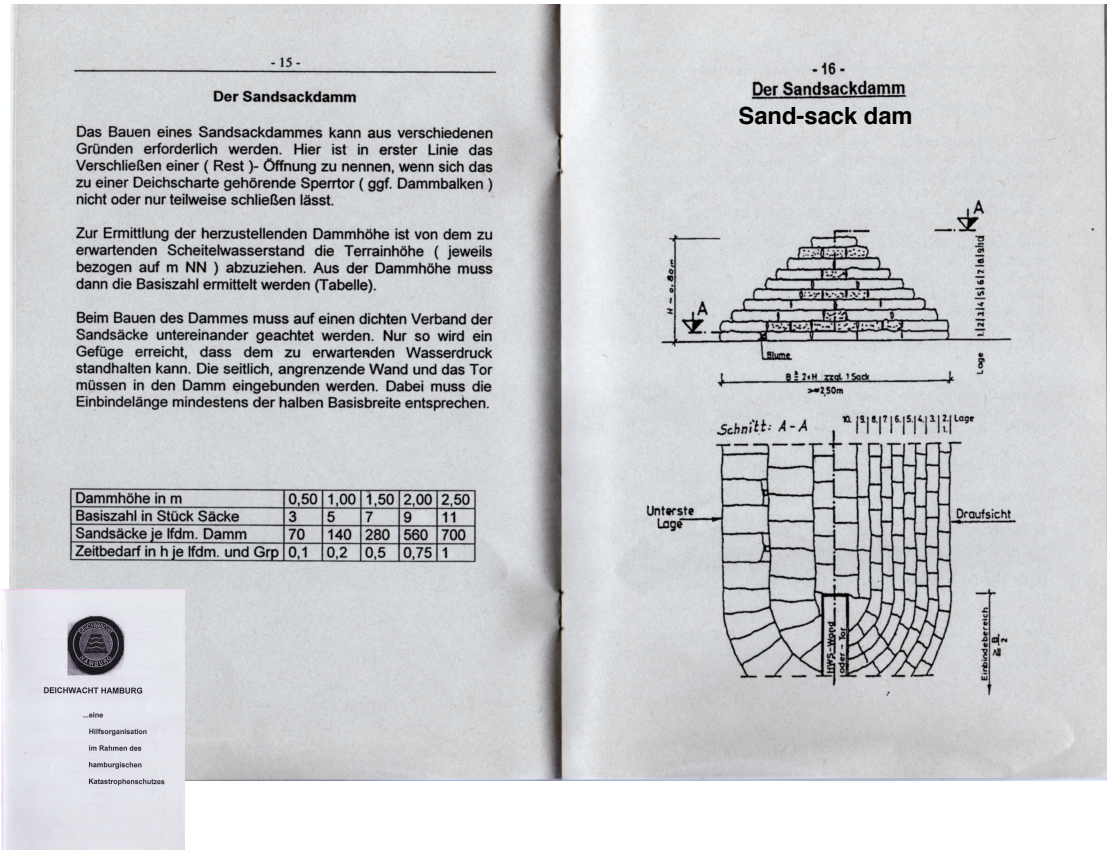
Table B.2 The Deichverband's operating statutes, dark italic excerpts highlight significant points in regards to the functioning's of the organisation [translated, see source for statures in German].

Section	Description
1	Members, task dyke show
2	**Members:** (1) Members of the Association are ***the respective owners of needs in the association area parcels***. Leaseholder, instead of the Owners' Association members. (2) The members shall be conducted with full names and addresses in a directory of members, which is led by Deichvogt, stored and updated as needed.
3	**Task:** (1) The Association shall ***be responsible for risk awareness in the population for storm surges and floods keep alive***. The task of supporting the Free and Hanseatic City of Hamburg in their obligation to people and land, the Federation also be protected from storm surges and flooding do that, he has to designate the competent authority forces to support the dike defence. (2) To carry out the association tasks have to alternate end of the association ***or to be designated forces to support the dike defence the obligation to participate in the dike defence*** organisation of the competent authority in operations, exercises and training. The Association shall ***notify the right and the duty to defects and damage to the flood protection facilities of the department responsible for maintaining and displaying offences under the dike order.***
4	**Dike directory, association area, plan:** (1) The association receives from the supervisory authority, a dike directory from which the Name, the type, the design elevations and dimensions as well as the accessories of the Flood protection systems are to be seen. (2) For the dressing area include those represented by the Wilhelmsburger ring dike (Klütjenfelder Hauptdeich, Müggenburger Hauptdeich, Stillhorner Hauptdeich, Obergeorgswerder Hauptdeich, Kreetsander Hauptdeich, Moorwerder Hauptdeich, Finkenrieker Hauptdeich, Buschwerder Hauptdeich, Pollhorner Hauptdeich, Schluisgro ver Hauptdeich, Haulander Hauptdeich, Reiherstieg Hauptdeich) from storm surges and flood protected parcels. (WVG § 6)
5	**Use of Land:** (1) The ***members shall tolerate the measures necessary for the implementation of the company's work on their land.*** You have to

	let their land for the purpose of preparation and execution of these measures entered by third parties, insofar as they are called upon by the Association. (2) The association may land, are devoted to public purposes, use only with the consent of the competent administrative authority, provided that the use is not already authorized by law. (3) For the compensation of financial losses by the use referred to in paragraphs 1 and 2 shall apply § 36 to 39 WVG.
6	**Dyke show:** The Association adopts official dike looking part. The Deichvogt divides the dike with sworn the dates.
7	**Participation in the management committee for flood protection:** (1) The Association proposes that the association is entitled in accordance with ***the arrangement on the management committee for flood protection for the existing members in the building authorities management committee for flood protection.*** (2) The members elected by the Baudeputation for the Management Committee for the Flood Protection Association members have the association form on meeting dates and agenda of the Management Committee for flood protection in. Has the Association adopted on an item on the agenda a decision, the members have this happen inside the front of the Administrative Committee.

(Source: http://www.deichverband-wilhelmsburg.de/index.html, google translate)

B.3 Deichwacht information booklet



- 15 -

Der Sandsackdamm

Das Bauen eines Sandsackdammes kann aus verschiedenen Gründen erforderlich werden. Hier ist in erster Linie das Verschließen einer (Rest)- Öffnung zu nennen, wenn sich das zu einer Deichscharte gehörende Sperrtor (ggf. Dammbalken) nicht oder nur teilweise schließen lässt.

Zur Ermittlung der herzustellenden Dammhöhe ist von dem zu erwartenden Scheitelwasserstand die Terrainhöhe (jeweils bezogen auf m NN) abzuziehen. Aus der Dammhöhe muss dann die Basiszahl ermittelt werden (Tabelle).

Beim Bauen des Dammes muss auf einen dichten Verband der Sandsäcke untereinander geachtet werden. Nur so wird ein Gefüge erreicht, dass dem zu erwartenden Wasserdruck standhalten kann. Die seitlich, angrenzende Wand und das Tor müssen in den Damm eingebunden werden. Dabei muss die Einbindelänge mindestens der halben Basisbreite entsprechen.

Dammhöhe in m	0,50	1,00	1,50	2,00	2,50
Basiszahl in Stück Säcke	3	5	7	9	11
Sandsäcke je lfdm. Damm	70	140	280	560	700
Zeitbedarf in h je lfdm. und Grp	0,1	0,2	0,5	0,75	1

DEICHWACHT HAMBURG

...eine
Hilfsorganisation
im Rahmen des
hamburgischen
Katastrophenschutzes

- 16 -

Der Sandsackdamm

Sand-sack dam

(Source: Informant during site visit, translation own)

Figure B.14 Diagram for building a sand-sack dam during a flood event, in the Deichwacht manual.

B.4 Wilhelmsburg's Sturmflut pamphlet

Die Busse fahren die Bus-Haltestellen an, die als „Sammelpunkt bei Sturmflut" ausgewiesen sind, und bringen Sie zu den S-Bahnhöfen Wilhelmsburg und Veddel oder auch direkt in die Notunterkünfte.
Vom **S-Bahnhof Veddel** werden Sie zum Hamburger Hauptbahnhof gebracht und von dort durch bereitgestellte Busse in eine Notunterkunft in Hamburg-Horn.

Vom **S-Bahnhof Wilhelmsburg** werden Sie nach Harburg und von dort mit Bussen in die Harburger Notunterkünfte gebracht.
Die Adressen der **Notunterkünfte** finden Sie auf der umseitigen Karte.

Sollte es Ihnen nach Abschluss der planmäßigen Evakuierung nicht mehr möglich sein, das gefährdete Gebiet zu verlassen, so können Sie in den eingerichteten **Fluchtburgen in Wilhelmsburg** Schutz finden. Dort können Sie in den oberen Geschossen das Ablaufen des Hochwassers abwarten.
Die Adressen der **Fluchtburgen** finden Sie ebenfalls auf der umseitigen Karte.

Kostenloses Warnsystem für Hamburg

Wenn die Elbe über die Ufer tritt oder ein Großbrand die Anwohner bedroht und z.B. Fenster und Türen zu schließen sind, erhalten Sie in Hamburg postleitzahlengenau kostenlose Warninformationen per SMS.

Melden Sie sich jetzt mit der Postleitzahl an, für die Sie gewarnt werden möchten.

Pro Mobilfunknummer kann derzeit nur eine Postleitzahl angegeben werden.

Und so geht's:
1. Mobiltelefon nehmen und SMS öffnen

2. Folgenden Text eingeben:
KATWARN(Leerzeichen)Postleitzahl

3. SMS an **0163 755 88 42** senden

Zum Abmelden senden Sie bitte eine SMS mit KATWARN(Leerzeichen)AUS an 0163 755 88 42

So werden Sie gewarnt:

Rechtzeitig vor Eintritt einer Sturmflut werden Sie gewarnt durch:

- **Böllerschüsse,**
- **Rundfunkwarnungen,**
- **Untertitelungen im Fernsehen,**
- **Sirenensignal:** Heulton von einer Minute Dauer:
  Schalten Sie sofort Ihr Rundfunk- oder Fernsehgerät ein!
- **Lautsprecherdurchsagen.**

Folgende Maßnahmen sollten Sie treffen:

- Bewahren Sie dieses Merkblatt stets griffbereit auf (z. B. in der Nähe des Telefons) und treffen Sie rechtzeitig Vorsorge.
- Wenn Sie sich in Keller- oder tiefliegenden Räumen (auch Tiefgaragen) aufhalten, suchen Sie bitte höher gelegene Stockwerke auf.
  Bitten Sie ggf. Ihre Nachbarn um Aufnahme.
- Verständigen Sie Ihre Nachbarn. Informieren und helfen Sie bei Bedarf auch älteren und gebrechlichen Menschen sowie ausländischen Mitbürgerinnen und Mitbürgern, insbesondere wenn sie sich in Keller- und Parterreräumen aufhalten.
- Schützen Sie Ihren Besitz. Lagern Sie keine hochwertigen Gegenstände in gefährdeten Räumen (z. B. Kellergeschossen).
- Sichern Sie elektrische und technische Anlagen (EDV, Telefonzentralen, Heizungsanlagen etc.) in den gefährdeten Räumen durch bauliche Maßnahmen.
- Prüfen Sie bitte rechtzeitig die Befestigung von Öltanks und sichern Sie diese gegen Aufschwimmen bei Überflutung. Lassen Sie sich bereits jetzt von Fachkräften beraten.
- Lagern Sie keine Chemikalien in den gefährdeten Räumen.
- Legen Sie sich Vorräte an, damit Sie sich bei Bedarf für einige Zeit selbst versorgen können.
- Denken Sie auch an Ihre Tiere.

Wer hilft Ihnen in dringenden Notfällen?

Schnelle Hilfe erhalten Sie in dringenden Fällen über die Notrufe der Feuerwehr 112 oder der Polizei 110.

Sollten Sie zum Beispiel krank, behindert oder gebrechlich sein und nicht mit Hilfe von Familienangehörigen oder Nachbarn das Gebiet verlassen können, rufen Sie bitte frühzeitig den Rettungsdienst über den Notruf der **Feuerwehr ☎ 112** an.
Ihre Beförderung aus dem gefährdeten Gebiet wird dann rechtzeitig veranlasst.
Wenn Sie nach einer Sturmflut Hilfe brauchen, wenden Sie sich bitte an Ihr Bezirksamt (Tel. 040/4 28 54-34 16).

Checkliste für Notfallmaßnahmen bei Überflutungen und Sturmfluten:

Erledigen:	Handgepäck:	Falls noch Zeit bleibt:
○ Radio einschalten (batteriebetrieben)	○ wichtige Dokumente	○ empfindliches Mobiliar etc. in höhere Stockwerke bringen
○ Strom abstellen	○ wichtige Medikamente	○ Chemikalien, Farben, Kraftstoffe etc. in höhere Stockwerke umlagern
○ Gas abstellen	○ Mobiltelefon	○ Heizöltanks ggf. fluten (um ein Aufschwimmen zu verhindern)
○ Taschenlampe bereithalten	○ warme Kleidung	
○ Nachbarn informieren	○ Decke, Schlafsack	
	○ Lebensmittel für 1–2 Tage	
	○ Trinkwasser für 1–2 Tage	
	○ Wertsachen, Geld	

Evakuierungsgebiete und Notunterkünfte:

Bei Sturmfluten über 7,30 m NN müssen die Bewohner Wilhelmsburgs, die keinen Schutz in höher gelegenen Räumen finden, evakuiert werden.
Zu Ihrer Unterbringung sind in Harburg und in Hamburg-Horn **Notunterkünfte** vorhanden.
Nutzen Sie bitte Ihre eigenen Fahrzeuge, um das **Evakuierungsgebiet** zu verlassen, beachten Sie dabei die Verkehrsleitmaßnahmen der Polizei.
Haben Sie kein eigenes Fahrzeug oder keine Mitfahrgelegenheit, werden Sie mit Bussen und der S-Bahn zu den Notunterkünften gebracht.

Sturmflut
Hinweise für die Bevölkerung

Hamburg

Merkblatt für Wilhelmsburg

Stand: September 2012

Liebe Hamburgerinnen, liebe Hamburger,

der Hochwasserschutz in Hamburg wurde in den vergangenen Jahren weiter verbessert. Der Ausbau der Hochwasserschutzanlagen ist vorangeschritten, so dass die Hamburger Stadtteile hinter den Hochwasserschutzanlagen bis zu einem Wasserstand von 7,30 m über Normal Null (NN) sicher sind. Dadurch hat sich die Gefahr, die von Sturmfluten für unsere Stadt und ihre Bürger ausgeht, erheblich verringert.

In dem vorliegenden Merkblatt erhalten Sie in Kurzform alle Informationen, die im Fall einer Sturmflut wichtig sind.

Sturmflutvorhersagen – wer informiert?

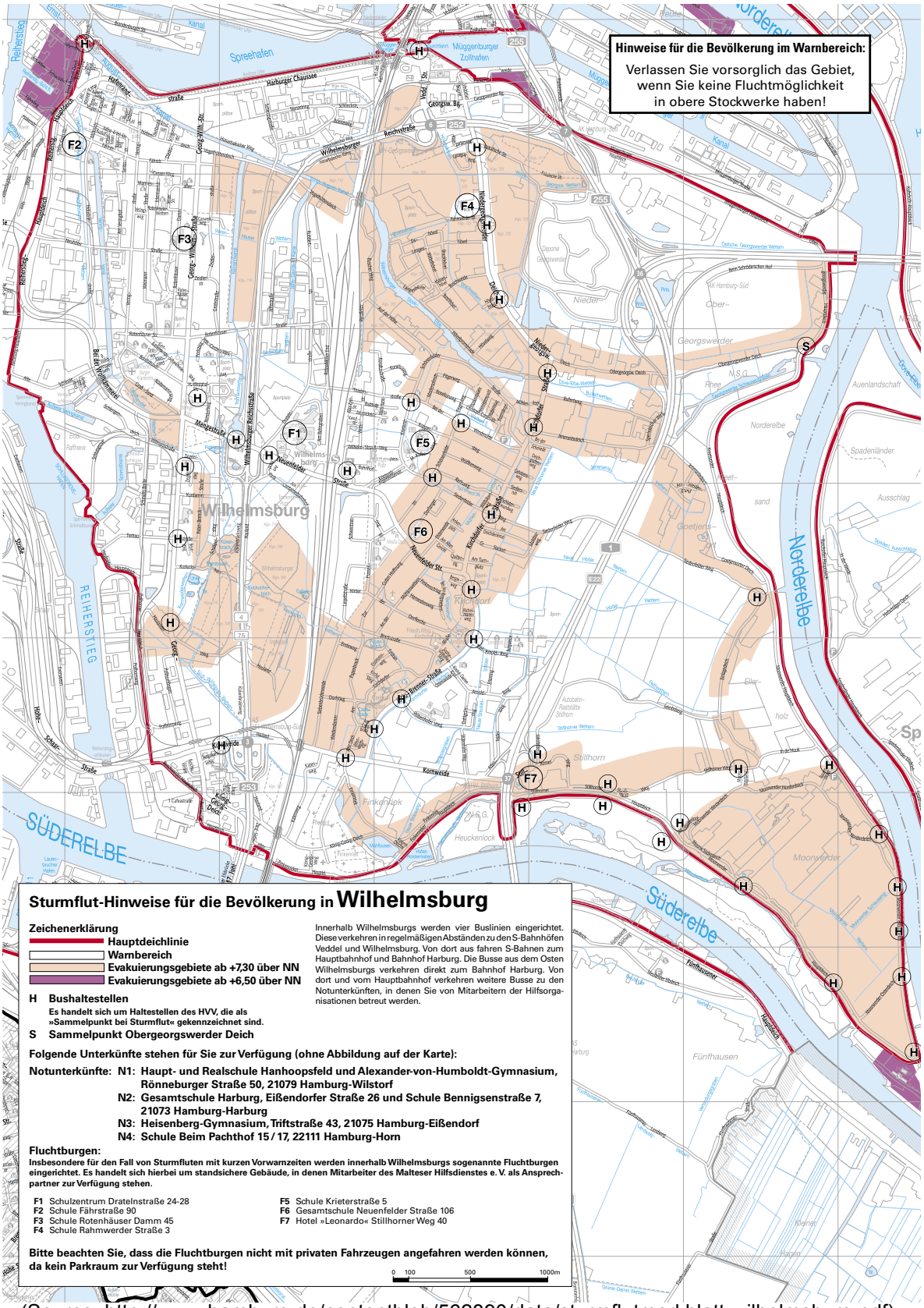
Bei der Gefahr von Sturmfluten können Sie sich unter folgenden Rufnummern über den zu erwartenden Wasserstand informieren:

Sturmflut-Ansagedienst	☎ 040/4 28 99-1 11 11
Bundesamt für Seeschifffahrt und Hydrographie (BSH)	☎ 040/31 90-31 90
Öffentliche Auskunft der Hamburg Port Authority	☎ 040/31 59 51 oder 040/31 59 52
Auskunft über den aktuellen Wasserstand im Hafen	☎ 040/4 28 47-32 85

Herausgeber: Behörde für Inneres und Sport,
Katastrophen- und Bevölkerungsschutz
Johanniswall 4, 20095 Hamburg, Tel. 040 428 28-0
www.hamburg.de/Katastrophenschutz

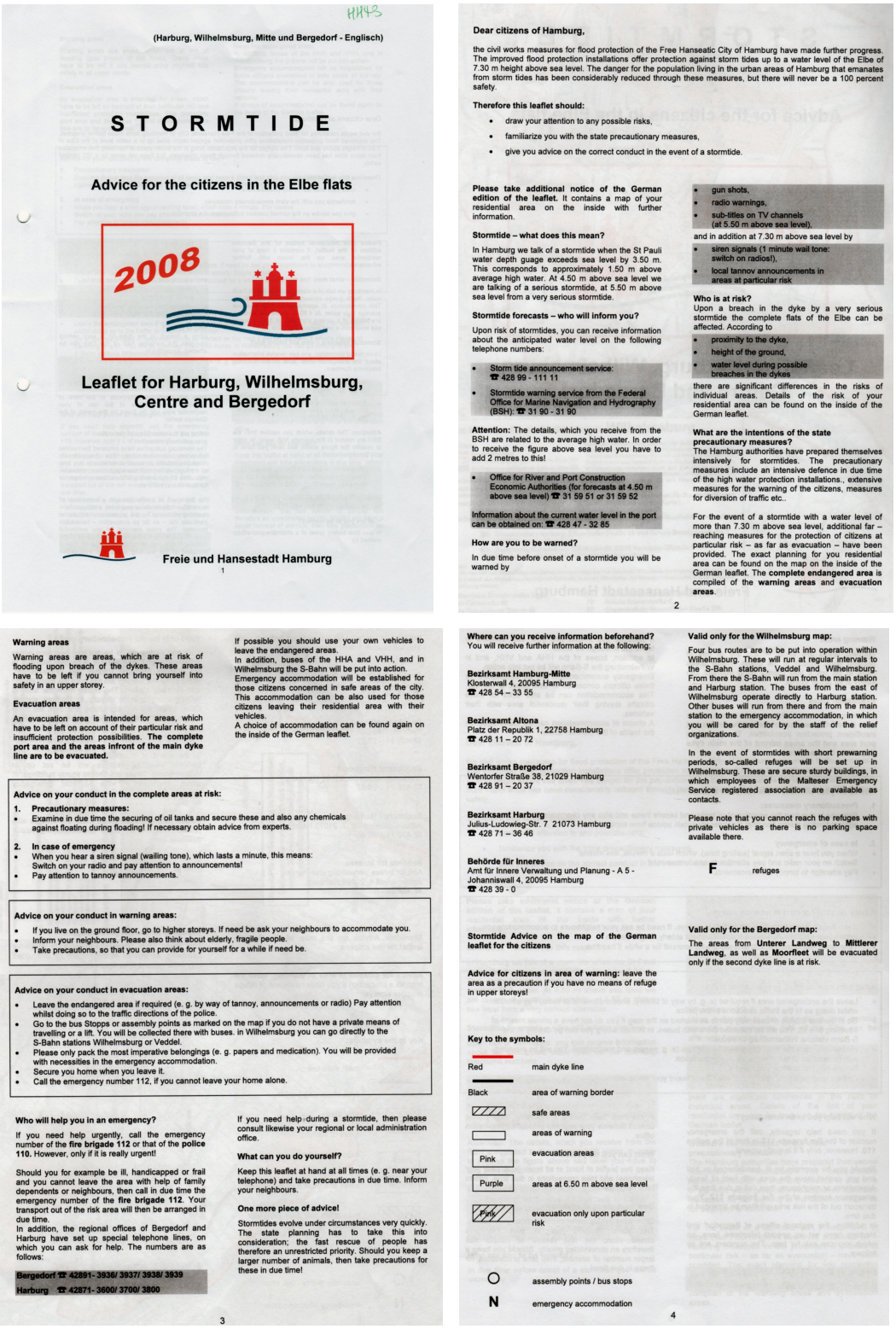
(Source: http://www.hamburg.de/contentblob/562890/data/sturmflutmerkblatt-wilhelmsburg.pdf)

Figure B.15a Page 1 of the Flood emergency pamphlet (Sturmflut Merkblatt, 2010) for Wilhelmsburg in German



(Source: http://www.hamburg.de/contentblob/562890/data/sturmflutmerkblatt-wilhelmsburg.pdf)

Figure B.15b Page 2 of the Flood emergency pamphlet (Sturmflut Merkblatt, 2010) for Wilhelmsburg in German



(Harburg, Wilhelmsburg, Mitte und Bergedorf - Englisch)

STORMTIDE

Advice for the citizens in the Elbe flats

2008

Leaflet for Harburg, Wilhelmsburg, Centre and Bergedorf

Freie und Hansestadt Hamburg

1

Dear citizens of Hamburg,

the civil works measures for flood protection of the Free Hanseatic City of Hamburg have made further progress. The improved flood protection installations offer protection against storm tides up to a water level of the Elbe of 7.30 m height above sea level. The danger for the population living in the urban areas of Hamburg that emanates from storm tides has been considerably reduced through these measures, but there will never be a 100 percent safety.

Therefore this leaflet should:

- draw your attention to any possible risks,
- familiarize you with the state precautionary measures,
- give you advice on the correct conduct in the event of a stormtide.

Please take additional notice of the German edition of the leaflet. It contains a map of your residential area on the inside with further information.

Stormtide – what does this mean?

In Hamburg we talk of a stormtide when the St Pauli water depth guage exceeds sea level by 3.50 m. This corresponds to approximately 1.50 m above average high water. At 4.50 m above sea level we are talking of a serious stormtide, at 5.50 m above sea level from a very serious stormtide.

Stormtide forecasts – who will inform you?

Upon risk of stormtides, you can receive information about the anticipated water level on the following telephone numbers:

- Storm tide announcement service: ☎ 428 99 - 111 11
- Stormtide warning service from the Federal Office for Marine Navigation and Hydrography (BSH): ☎ 31 90 - 31 90

Attention: The details, which you receive from the BSH are related to the average high water. In order to receive the figure above sea level you have to add 2 metres to this!

- Office for River and Port Construction Economic Authorities (for forecasts at 4.50 m above sea level) ☎ 31 59 51 or 31 59 52

Information about the current water level in the port can be obtained on: ☎ 428 47 - 32 85

How are you to be warned?

In due time before onset of a stormtide you will be warned by

- gun shots,
- radio warnings,
- sub-titles on TV channels (at 5.50 m above sea level),

and in addition at 7.30 m above sea level by

- siren signals (1 minute wail tone: switch on radios!),
- local tannov announcements in areas at particular risk

Who is at risk?

Upon a breach in the dyke by a very serious stormtide the complete flats of the Elbe can be affected. According to

- proximity to the dyke,
- height of the ground,
- water level during possible breaches in the dykes

there are significant differences in the risks of individual areas. Details of the risk of your residential area can be found on the inside of the German leaflet.

What are the intentions of the state precautionary measures?

The Hamburg authorities have prepared themselves intensively for stormtides. The precautionary measures include an intensive defence in due time of the high water protection installations., extensive measures for the warning of the citizens, measures for diversion of traffic etc..

For the event of a stormtide with a water level of more than 7.30 m above sea level, additional far – reaching measures for the protection of citizens at particular risk – as far as evacuation – have been provided. The exact planning for you residential area can be found on the map on the inside of the German leaflet. The **complete endangered area** is compiled of the **warning areas** and **evacuation areas**.

2

Warning areas

Warning areas are areas, which are at risk of flooding upon breach of the dykes. These areas have to be left if you cannot bring yourself into safety in an upper storey.

Evacuation areas

An evacuation area is intended for areas, which have to be left on account of their particular risk and insufficient protection possibilities. **The complete port area and the areas infront of the main dyke line are to be evacuated.**

If possible you should use your own vehicles to leave the endangered areas.
In addition, buses of the HHA and VHH, and in Wilhelmsburg the S-Bahn will be put into action. Emergency accommodation will be established for those citizens concerned in safe areas of the city. This accommodation can be also used for those citizens leaving their residential area with their vehicles.
A choice of accommodation can be found again on the inside of the German leaflet.

Advice on your conduct in the complete areas at risk:

1. **Precautionary measures:**
   - Examine in due time the securing of oil tanks and secure these and also any chemicals against floating during floading! If necessary obtain advice from experts.
2. **In case of emergency**
   - When you hear a siren signal (wailing tone), which lasts a minute, this means: Switch on your radio and pay attention to announcements!
   - Pay attention to tannoy announcements.

Advice on your conduct in warning areas:

- If you live on the ground floor, go to higher storeys. If need be ask your neighbours to accommodate you.
- Inform your neighbours. Please also think about elderly, fragile people.
- Take precautions, so that you can provide for yourself for a while if need be.

Advice on your conduct in evacuation areas:

- Leave the endangered area if required (e. g. by way of tannoy, announcements or radio) Pay attention whilst doing so to the traffic directions of the police.
- Go to the bus Stopps or assembly points as marked on the map if you do not have a private means of travelling or a lift. You will be collected there with buses. in Wilhelmsburg you can go directly to the S-Bahn stations Wilhelmsburg or Veddel.
- Please only pack the most imperative belongings (e. g. papers and medication). You will be provided with necessities in the emergency accommodation.
- Secure you home when you leave it.
- Call the emergency number 112, if you cannot leave your home alone.

Who will help you in an emergency?

If you need help urgently, call the emergency number of the **fire brigade 112** or that of the **police 110.** However, only if it is really urgent!

Should you for example be ill, handicapped or frail and you cannot leave the area with help of family dependents or neighbours, then call in due time the emergency number of the **fire brigade 112**. Your transport out of the risk area will then be arranged in due time.
In addition, the regional offices of Bergedorf and Harburg have set up special telephone lines, on which you can ask for help. The numbers are as follows:

Bergedorf ☎ 42891- 3936/ 3937/ 3938/ 3939
Harburg ☎ 42871- 3600/ 3700/ 3800

If you need help during a stormtide, then please consult likewise your regional or local administration office.

What can you do yourself?

Keep this leaflet at hand at all times (e. g. near your telephone) and take precautions in due time. Inform your neighbours.

One more piece of advice!

Stormtides evolve under circumstances very quickly. The state planning has to take this into consideration; the fast rescue of people has therefore an unrestricted priority. Should you keep a larger number of animals, then take precautions for these in due time!

3

Where can you receive information beforehand?
You will receive further information at the following:

Bezirksamt Hamburg-Mitte
Klosterwall 4, 20095 Hamburg
☎ 428 54 – 33 55

Bezirksamt Altona
Platz der Republik 1, 22758 Hamburg
☎ 428 11 – 20 72

Bezirksamt Bergedorf
Wentorfer Straße 38, 21029 Hamburg
☎ 428 91 – 20 37

Bezirksamt Harburg
Julius-Ludowieg-Str. 7 21073 Hamburg
☎ 428 71 – 36 46

Behörde für Inneres
Amt für Innere Verwaltung und Planung - A 5 -
Johanniswall 4, 20095 Hamburg
☎ 428 39 - 0

Stormtide Advice on the map of the German leaflet for the citizens

Advice for citizens in area of warning: leave the area as a precaution if you have no means of refuge in upper storeys!

Key to the symbols:

Red	main dyke line
Black	area of warning border
	safe areas
	areas of warning
Pink	evacuation areas
Purple	areas at 6.50 m above sea level
Purple	evacuation only upon particular risk
○	assembly points / bus stops
N	emergency accommodation

Valid only for the Wilhelmsburg map:

Four bus routes are to be put into operation within Wilhelmsburg. These will run at regular intervals to the S-Bahn stations, Veddel and Wilhelmsburg. From there the S-Bahn will run from the main station and Harburg station. The buses from the east of Wilhelmsburg operate directly to Harburg station. Other buses will run from there and from the main station to the emergency accommodation, in which you will be cared for by the staff of the relief organizations.

In the event of stormtides with short prewarning periods, so-called refuges will be set up in Wilhelmsburg. These are secure sturdy buildings, in which employees of the Malteser Emergency Service registered association are available as contacts.

Please note that you cannot reach the refuges with private vehicles as there is no parking space available there.

F refuges

Valid only for the Bergedorf map:

The areas from **Unterer Landweg** to **Mittlerer Landweg**, as well as **Moorfleet** will be evacuated only if the second dyke line is at risk.

4

(Source: informant in Ministry of Interior and Sport, 2011)

Figure B.15c Flood emergency pamphlet (2008) for Wilhelmsburg in English.

B.5 Informants' Attribute info.

Table B.3 Attribute information of informants in Wilhelmsburg.

Interviewee No.	Informant Type	Gender	Age	Nationality	Education	Occupation	Time lived or worked in Wilhelmsburg (years)	Building type lived in	Floor lived on	Intent to stay
P1	New W	Female	48	German		Missionary & aftercare co-ordinator	1.5	Multi-storey	2nd floor	Yes for a couple of years
P2	New W	Male	37	German	Theology degree	Missionary	1.5	Multi-storey	Ground floor	
P3	New W	Male	49	German	Theology seminary	Missionary	1.5	Multi-storey	2nd floor	Yes for a couple of years
P4	Old W	Female	70	German		Takes care of elderly and handicapped people (retired)	70	Multi-storey	4th floor	
P5	Old W	Female	57	German	Secondary school (vocational training as a hairdresser)	Secretary	50	/	/	Yes wants to go back
P6	Old W (couple)	Female	68	German		Agent for Lloyds insurance	68	Double storey house	/	
P7	New W	Female	59	German		Retired nautical officer	11	Multi-storey	3rd floor	No
P8	Old W	Male	70	German	Apprentice ship builder	Retired civil servant (Behoerde fuer Innes)	46			Yes cant afford anywhere else

Interviewee No.	Informant Type	Gender	Age	Nationality	Education	Occupation	Time lived or worked in Wilhelmsburg (years)	Building type lived in	Floor lived on	Intent to stay
P9	Old W (couple)	Male	70	German		Civil engineer	55	Double storey house	/	Yes
P10	New W	Female	54	German	Social work degree	Social worker	17	Double storey house	/	Yes
P11	New W	Female	41	German		Innovation manager in a patent agency	5	Double storey house	/	Yes for a couple of years
P12	Student	Male	23	German	BSc	Student	3.5	/	/	No
P13	New W	Male	66	German		Retired but teaches at the university of applied science (social policy)	6	Multi-storey	5th floor	Yes
P14	Old W	Female	51	German		Teacher	51	Double storey house	/	Yes
P15	Student	Female	29	German	MA	Student	0.5	Multi-storey	Ground floor	Yes for a couple of years
P16	New W (works)	Female	50	German		Social worker	4	/	/	No
P17	Immi	Male	28	Turkish	Currently studying philosophy and sociology	Works in burgerhaus	22	Multi-storey	2nd floor	Yes
P18	New W	Male	49	German	Tax advising diploma	Unemployed	10	Multi-storey	1st floor	Yes

Interviewee No.	Informant Type	Gender	Age	Nationality	Education	Occupation	Time lived or worked in Wilhelmsburg (years)	Building type lived in	Floor lived on	Intent to stay
P19	Student	Female	43	German	Studying social work	Student	1.5	House	Ground floor	Yes
P20	Old W	Male	47	German		Farmer	47	Double storey house	/	
P21	New W	Female	38	German/Nigerian	MBA	Loyds Press dept	2	Multi-storey	1st floor	No, would like to feel connected though
P22	Immi	Male	55	Turkish	Primary school teacher	Post office	10	/	2nd floor	Yes
P23	Student	Male	31	German	Studying to build ships at TUUH	Student	1	/	/	Yes
P24	Student	Female	36	German	Studying history and Turkish		4	/	1st floor	Yes
P25	Old W	Female	62	German	Apprentice (law clark, kindergarten teacher)	Kindergarten teacher/ secretary	51	/	/	Yes

Interviewee No.	Informant Type	Gender	Age	Nationality	Education	Occupation	Time lived or worked in Wilhelmsburg (years)	Building type lived in	Floor lived on	Intent to stay
P26	Student	Male	29	German	Studying informatics/ computer science	Student	2	Multi-storey	7th	Yes - if I can get a flat here
P27	Immi	Male	27	Iranian	Studying law	Law student/ works in Buergerhaus	18	Multi-storey	4th floor	No
P28	Old W	Male	49	German	Biologist	Biologist/Tour Guide	22	Multi-storey	3rd floor	No

B.6 Sources & outcomes of Information

Table B.4 Sources of verbal persuasion and informants' impressions from interactions and messages

	Community interaction	Organisational interaction	Media Messages
Sources of interaction	**Old Wilhelmsburger :** • "*we've talked to eye witnesses*" (P1); • "*And I listened to… their stories... for many of the old/elderly German people here, the flood is still so present in their memories they can, they could tell me, they were able to tell me details: smells, sounds*." (P3); • "*I talked to an elderly lady, she's living down here the street.*" (P3) • "*I met lots of people that were living here with the flood in 62. The worst thing was that they didn't have anything to drink.*" (P7); • "*the ones that practically experienced the flood, who are contemporary witnesses. They can tell you much about it.*" (P11); • "*I know that it was flooded once… and that everything was under water but that is really a long time ago. My neighbour told me that.*" (P21); • "*I recognise then when speaking to old Wilhelmsburg people that everybody knows that for example that those cellars are wet.*" (P24). **Family:** • "*As a small child he* [her father] *put me in the front of his bike and Sundays we went to the Elbe and I was never*	**The Behörde (Authorities)/the City:** • " *right now we have* ***a siren warnings*** *every year, or every half a year*" (P1) (P2); • "*I received a* ***paper*** *in the post about where the collection point would be.*" (P2); • "*Yes I have* [Sturmflut pamphlet] *before the storm surge, yes! I have it down here in the desk in the drawer. We get it every year.*" (P4); • "*...also* ***flyers*** [Sturmflut pamphlet] *are constantly distributed and you can inform yourself.*" (P11); • *Knows where it* [Sturmflut pamphlet] *is, and "I've read it and I'm sure they said, always be sure to keep some stuff in your basement to be prepared, to have something to eat…*" (P12); • "*…two times in the year we have* ***warning with siren****, but it's not good prepared. People don't know when it will be and how long it will be and so on…*" (P13); • "T*hey say* [in the Sturmflut pamphlet]*, 'please inform your neighbours'*" (P14); • "*Population is regularly informed by the city, every household's getting* ***a brochure or flyer*** *or informational material on how they can or have to,*	**Radio:** • "*No. I had my radio on, and I looked into the internet and that was fine* [in providing sufficient information for the bomb threat]" (P1); • "*And I went to the neighbours and I told them, you have to pack your bags. And I listened to the radio and I rang the bell of the neighbours.* " (P10); • "*...Then I heard on the radio that they were trying to defuse the bomb and it was all evacuated*" (P26); • "*And you can hear in the news that there are these anniversaries.*" (P27). **Internet**: • "*No. I had my radio on, and I looked into the internet and that was fine* [in providing sufficient information for the bomb threat]" (P1); • "*Actually not, for a topic that should be, lets say very quickly answered. I mean at the moment there is a time but for example for a real emergency situation I would have expected that you get to information much faster* [*on the internet*]" (P23) **Newspapers & Reports:** • "*I think it was in the newspaper, I saw articles in the newspaper dealing with… Well next year will be 50 years*

	Community interaction	Organisational interaction	Media Messages
	afraid of the water. There was low tide and high tide, changes, that when the flood was there was no fear" (P5); • "*my father lived here in the flood in the Reiherstieg, the old Wilhelmsburg.*" (P8); • "*My mother-in-law…when she rebuilt again, the house had to have stairs so that she didn't have to live on the ground level, she was always afraid of flooding* [afterwards]" (P14); • "*…like my mother, she tells me about it, because she lost a friend in that flood*" (P15); • "*…as much as we heard, my children heard as well. They also learned much in school. Every year they talk about this topic for a week or more.*" (P22); • "*And parents history is, my father had a new car. That was a big thing in 1962 to have a car. And my parents... They lived here in the Vogelhuettendeich, just around the corner. So they woke up. They heard thing happening, they got to know that the dikes are broken, were broken.*" (P28). **Friends & peers:** • "*…we* [the Deichwacht] *are here...*" (P8); • "*I questioned my neighbour precisely about this issue and asked what she would do and she said 'Why? It's easy, if the flood comes, I will go*	*or should behave in case of a flood.*" (P22); • "*People from Port Authority. Some people are aware of the situation and they say people begin to sleep because nothing happens. So they feel safety.*" (P28). **IBA/IGS:** • "*And definitely it was said by the representatives from IBA and the accompanying planning office, which are organizing the competition that flood protection is excluded.*" (P18); • "*But during those first hearings of IBA there was a work shop on how to live in a flooded environment…*" (P24). **Emergency teams:** • "[*Information during a warning*] … *the people from the loudspeaker cars go along the streets…*"(P4); • "*I have already packed the bags. The last time, we just had moved in a new flat, the last time 7 years ago. They had an evacuation… They said, they said, the flood would further rise and they would, they would kindly ask us to prepare to be evacuated.*" (P10); • "*Yeah probably there would be police on the streets in day time. We had some bomb warnings here…*" (P26). **Local organisations:** • "*Deichwacht is here to watch over the dikes, and reinforce them with sandbags should the need arise*" (P8);	*wont it? Or is it 60? 50 years, 50 years of flooding, 1962, yeah.*" (P1); • "*Yes I do. Yeah because I have also look into reports and I know that they have been improvements, huge improvements. I know that they have a contingency plan and all of that, so.*" (P1); • "*But during those first hearings of IBA there was a work shop on how to live in a flooded environment and there was Turkish kids who told about like the dangers of flood and what's happening here and basements being constantly wet and stuff like that... I just read about it in the newspaper. I didn't take part* [in IBA's workshop]. *It was in the beginning it was in 2006 or 7. I just read about it in the newspaper.*" (P24)

	Community interaction	Organisational interaction	Media Messages
	upstairs and when the water is gone, I come down again." (P11); • "*A guy told me, in the Soul Kitchen actually. We were talking about this. The dike thing.*" (P12); • "*I know that the father of a friend is with the Deichwacht. He for sure would know.*" (P17); • "*Yes. As my housekeeper told me there would be, the basement could be wet.*" (P26); • *"my children heard as well. They also learned much in school. Every year they talk about this topic for a week or more."* (P22). **Self**: • "*And I went to the neighbours and I told them, you have to pack your bags.*" (P10).	• "*there is one society, organisation and they are offered tours by bicycle through Wilhelmsburg. I know that they had two slide show presentations nights about the topic, I mean about the flood.*" (P16); • "*You know I'm the leader of the Wilhelmsburger Deich organisation* [Deichverband] *and we go in the schools and make. We speak with the children what is important to our dikes in Wilhelmsburg. And we got to Islam Vereine* [Islamic societies]". (P20). **Local community venues:** • "*Such a documentation. About the flood and they showed it, I don't know in the Buergerhaus, community centre, maybe.*" (P16). **Research Organisations:** • - "*people listened to that [*Dr Pasche's talk on precautionary measures for TUHH] *and then said 'perfect', and in the next year they built a house and put the whole stuff in the basement again* [husband]" (P6).	
Impressions from interactions & messages	**No awareness:** • "*No one can imagine it (the 1962 flood) anymore… the younger population and around 50 000 inhabitants, 10% know what the threat means*" (P6); • "*nothing…only what you've* [the interviewer] *told me… the only thing that kind of makes it more day-to-day*	**The Behörde are prepared:** • "*I know that there are emergency, evacuation plans. I know that there is some people who are checking the dikes all the time. They are some kind of geologist, calculating the risks, assessing the risks.*" (P2); • "*they really made sure there is a huge, well-thought-through system of dikes*	**People still thinking about the flood risk:** • "*…the discussions that I have been following, not very frequently, but here and there, give me the impression of an awareness that is still there. That people still think about it and haven't forgotten about it*" (P1); **Dredging of Elbe a problem:**

	Community interaction	Organisational interaction	Media Messages
	is the dike…and some bus stations that say gathering point if there is a flood"(P15); • "*I think most people who live here, don't know where to go, how it* [flood] *come, what they can do*" (P16); • "*But I think only a minority knows about it. I always think that this is the greatest threat, when people don't know anything about it.*" (P17); • "*nothing* [chuckles]. *I know that it was flooded once, but that is maybe 10 years ago. Or even longer, I can't really remember.*" (P21) **Awareness in certain groups:** • "*It's still an awareness in the German mindset. But I think all the immigrants don't even know about it.*" (P1); • "*The foreigners, I don't really know. But all the old-Wilhelmsburger know…*"(P4); • *"the Wilhelmsburger still live with it, but became calmer. The dikes were raised." (P5);* • "*But we know* [old-Wilhelmsburgers] *that it will become higher. And no one can predict it that the dikes are full again until the top.*" (P8); • "*Everyone knows it* [Sturmflut pamphlet]. *Every German person know it, I hope so. But I don't know if the immigrant people read it, know it. Because they don't know the history of 1962*" (P18);	*and made it higher*" (P3); • "*Yes, well the raising of the dikes to 8m. They are really solid and are constantly monitored. I think that the dike protection is quite good here and is well monitored. I really trust that…enough information. In case of a storm surge there are emergency points, which are marked, also flyers are constantly distributed and you can inform yourself. I think they are doing a good job.*" (P11); • "*They installed the meeting points, where you're supposed to go if there is a threat.*" (P14); • "*We have good personal that look for the dikes. I'm sure we are on a good way and I'm not afraid at all that Wilhelmsburg have a problem.*" (P20); • "*population is regularly informed by the city" "every household's getting a brochure or flyer or informational material on how they can or have to, or should behave in case of a flood*" (P22); • "*They are prepared. And you can hear in the news that there are these anniversaries. And they always tell about Wilhelmsburg and of the flood. That is quite well known in Hamburg.*" (P27)*[1]; **Unsure about the Behörde's plans:** • *"Well I mean, the Behoerde is also IBA. IBA is setting the benchmark and*	• "*there is the possibility that through dredging out of the River Elbe that the risk of the tides even going higher is bigger*" (P2); • "*the narrowing of the Elbe*" [Wife] - "*the river isnt a river anymore, they have made a canal out of the river...*[Husband]" (P6); • *"We have climatic change, we have Meerespiegelanstieg {Sea level rise}. And we have these deepenings of the Elbe.*" (P28). **Climate change a concern:** • "*Not at the moment, but we know what is threatening us with climate change. And still we are thinking despite all problems, technically we will overcome this as well.*" (P6); • "*The sea level is rising. In Hamburg it will rise very much and you have to prepare in Wilhelmsburg. I think you have to in 20 years or so.*" (P10); • "*climate change is a big topic*" (P21); • *"We have climatic change, we have Meerespiegelanstieg {Sea level rise}. And we have these deepenings of the Elbe.*" (P28). **The flood defence improved & improving:** • "*And there was a flood in 1976, too. It was higher than in 1962, I think 1976, maybe. It was very much higher but in the meantime they were more prepared for it.*" (P13).

	Community interaction	Organisational interaction	Media Messages
	• "*It's old people's stories. So it's not young people's realities I think*." (P28); • "*The new people coming to Wilhelmsburg, they are not aware of the situation*" (P28). **Awareness is on the rise:** • "*Actually I think it's like a rising awareness thing until next year* [50th anniversary of 62 flood, 2012]*, but when I came here... in the beginning it was not a topic at all. And it just started during the last 1.5 years. That it was a topic.*" (P24). **No interest:** • "*…people don't… they read the prices of their beer bottles, that' what they read, but not …* [points to Sturmflut pamphlet]*, writing on a paper with 200 words on one page…*" (P2); • "*I think we don't really bother* [with flooding], *we don't live in a constant state of fear*" (P9); • "I think nobody in my generation really thinks about flooding" (P12); • "*the people are not interesting* [in flooding]*, not really*" (P20); • "*I wouldn't say that is a topic that I'm really so interested in, although it might be a threat, also for me personally living here. But it's something that is far away, somehow, so it's not really present…*" (P21); • "*There's no consciousness about this*	*when the IBA says 'No protect', when IBA says no protect, the state Hamburg says, 'Don't need protect. The dike is high enough, or not' don't know.*" (P18); **The Behörde provide info. its a residents responsibility to find it & info. themselves:** • "*They* [the Behoerde] *assume that you get your own information, but many don't inform themselves.*" (P5); **Deichwacht not as strong as in the past:** • "*But I not really feel safe about the real management of the flood. We have difficulties for instance with the dike watch. These are volunteer people who look at the dikes…the most of them are very old and as an association, they have no experience with floods...*" (P13); • "*…I think the priorities of having them* [the Deichwacht] *are not really high, or they have lower. So it was really a problem to find a new house for them.*"(P24). **Haven't heard much:** • "*Personally I didn't hear much, so I can't say the Behoerde didn't do anything. Probably they did something, but how much and with how much commitment, I don't know*" (P17). **Sturmflut pamphlet 'yes, but':**	**Better media culture today then in 62:** • "*For 1962 there was no information and no media culture like we have now. So it would no problem to get informed if there's some risk or anything*." (P14). **The 1962 flood & its 50th Anniversay:** • "*I think it was in the newspaper, I saw articles in the newspaper dealing with… Well next year will be 50 years wont it? Or is it 60? 50 years, 50 years of flooding, 1962, yeah*." (P1); • "*That was in 62. I have read much, seen much. It was a huge catastrophe and many people died and many became homeless*." (P22); • "*Well the flood of 62 you know of course. I informed myself a bit about it before I moved here*." (P23); • "*There's a lot of talking about the history of the flood because of the 50th anniversary next year.*" (P24)*[2] • " *And you can hear in the news that there are these anniversaries. And they always tell about Wilhelmsburg and of the flood. That is quite well known in Hamburg.*" (P27); • "*The next year is the 50 years aniversary of the flooding catastrophe. I think there will be some actions to remember. Big images put to some buildings and after the party these images are torn down and you can forget it again.*"(P28).

	Community interaction	Organisational interaction	Media Messages
	problem [flooding]*, so people don't care*" (P28).	• "*I get it* [Sturmflut pamphlet]*, but I don't know where it is.*" (P11); • "*you get so much adverstisement and I never look at them…one of those colourful brochures, you just throw out, because there are so many…I think, had I seen the title, I would have* [read it]." (P15); • "*There's so much from the City, but especially that, no* [hasn't received the Sturmflut pamphlet]" (P17); • "*no I don't know it* [Sturmflut pamphlet]" (P19); • "*…like this* [Sturmflut pamphlet] *of course everyone gets one, but the people don't read it*" (P20); • "*some people can't read the flyer of course or can't completely understand it. They should give out the flyer in more languages*" (P22); • "*I think that every household here in Wilhelmsburg got this* [Sturmflut pamphlet]*. But whether they stored it or not, this is everyone's own responsibility*" (P25); • "*Once a time I read it* [Sturmflut pamphlet]*…I think most people throw it away, its advertisement*" (P28). **The Behörde do not want to info. residents they want to sell land:** • "*I think the city has no interest to make the aware of, because that would make the think more about this place.*	

	Community interaction	Organisational interaction	Media Messages
		So they show, buy flats, but not think too much." (P28).	
Impressions of presence [talk about flooding & flood risk] in local conversations	**Doesn't come up in local conversations:** • "*It doesn't come up* [in local conversation]. *The flood as such or a threat of a flood doesn't come up in conversations really."* (P2); • "*People don't talk that much* [about flooding]." (P16); • "*But nobody talks about it or has it like in his mind, so.*" (P24). **Comes up when there is an event:** • *"It comes up when, they have these: it came up once, they had this warning, the sirens, and they were just testing the flood.*" (P2); • "*Little* [talk about flood risk], *but when there is a thunderstorm …*" (P4); • "*Not at the moment* [topic in local conversation]. *It used to be of interest. It was now 45 years storm surge, 40 years storm surge. Then it is of interest. Or if there should be a film about the storm surge with different actors, sometimes a lurid one sometimes a calm one. Then it is of interest. Not at the moment. I think it will be if interest next year.*" (P10); • "*Yes hmmm, in general, when there is a flood somewhere then they talk about it.*" (P22). **Not flooding, but dikes:**		

	Community interaction	Organisational interaction	Media Messages
	• "*I never talked to anybody about floods, flooding...No* [talked to people about the dikes]. *Only because there is this fence on the north side, so, only talk with people how it would be nice to go up there and have a beer.*" (P26).		
Description of attitudes held or perceived	• "it's the same attitude [as in Turkey before an earthquake] here too… As long as nothing happens, no problem." (P1); • "I think we don't really bother [with flooding], we don't live in a constant state of fear" (P9); • "I heard enough about it and I don't want to hear it anymore" (P11); • "Well I'm not afraid, also my girl friends and my neighbours and all the other people I know. They trust that the dikes keep up." (P25); • "It's old people's stories. So it's not young people's realities I think." (P28).	- "*I try to follow at least a bit the discussion going on especially now as we have this IBA coming…*" (P1); - "*I think the city has no interest to make the aware of, because that would make the think more about this place. So they show, buy flats, but not think too much.*" (P28).	

Table B.5 Environmental clues & memoir reported by informants

	Environmental clues	Memoria
Sources of learning	**Bus stop gathering & collection points:** • "*You have signs on some of the bus, where it says meeting points*" (P1); • "*It's always written on the bus stops. Gathering point in case of a storm surge.*" (P9); • "*In case of a storm surge there are emergency points, which are marked…*" (P11); • "*you see those, at the bus stop, you see those, this is a gathering point for floods*" (P15); • "*there are certain bus stops, and then there come buses and then you're picked up there*" (P25); • "*on the street there are those points at the bus stations*" (P26). **System & height of dikes:** • "*I think that since they build the dikes that there is no real threat of floods*" (P2); • "*I would say there is hardly a threat… after the flood in 62 they made the dams* [dikes] *higher*" (P3); • "*I know that the dikes were raised significantly, 2,3 metres they're higher.*" (P4); • "*At the moment I think the dikes are safe*" (P6); • "*Well there is not a threat for flooding at the moment. The dikes have a certain height… so that the high water can't go over it*" (P8); • "*Protection seems very good now… I mean there are dikes everywhere*" (P12); • "*No, I feel safe, the dikes are high enough*" (P14); • "*nothing…only what you've told me… the only thing that kind of makes it more day-to-day is the dike…and some bus stations that say gathering point if there is a flood*" (P15); • "*dikes between 8 and 8.2metres...*" (P18); • "*Sure we are safe in Wilhelmsburg because our dikes are really*	**1962 flood marks:** • "*you have marks on buildings which have the number 1962. It's actually at the post office.*" (P1); • "*And you can see everywhere the marks people have on their houses 1962, which water level, were the water was.*" (P2); • "*…there are signs everywhere to show you up to which point the water got…*" (P12); • "*there is a sign there at the wall… there is a flood mark*" (P16); • "*Exactly, everywhere around here, there are the flood signs... they are there, they remind.*" (P19); • "*…there are marks at the houses where you can see until where the water came*" (P21); • "*You can see the flood height and the number of fatalities or so. I'm clearly aware of that*" (P23); • "*Where I currently live, we have just like, it's like a bit above my knee height, the flood mark on the outside of the building.*" (P24). **1962 wave memorial:** • "*Here is a memorial in the customs port with this flood wave.*" (P19). **Elbinsel Museum:** • "*Well I have had a little look in the museum here on the Elbinsel, which explains what people did after that in order to prevent floods from happening* " (P1) **50th Anniversary of 1962 flood preparations:** • "*I think it was in the newspaper, I saw articles in the newspaper dealing with… Well next year will be 50 years wont it? Or is it 60? 50 years, 50 years of flooding, 1962, yeah.*" (P1); • "*we have the 50th anniversary next year*" (P6); • "*There's a lot of talking about the history of the flood because of the 50th anniversary next year. And what I didn't know was that the main problem for the people who stayed here, was to have*

	Environmental clues	Memoria
	good" (P20); • "*Hamburg is well prepared, I see dikes everywhere surrounding the district…*" (P22); • "*another thing is the mowing of the dikes. It should be done by sheep in, if it's made the best way… They always go on the same tracks with their big heavy machinery and they damage the dike and that threatens the safety of the dike*." (P28). **Being on an island:** • "*We are living on an island*." (P2); • "*Wilhelmsburg that it is an island*" (P6); • "*we're an island in the middle of the river*" (P17); • "*that it is an island*." (P24). • "Islandy...There's water around" (P26); • "*But Wilhelmsburg is an island and it's surrounded by water and that's the biggest threat*." (P27); **Being surrounded by water:** • "*And there is water, I like living close to the water*." (P21); • "*So that I have lots of water around*" (P24); • "*Because Wilhelmsburg is all surrounded by water* " (P25); • "there the Elbe is right there in front of the door" (P27); **Annual siren warnings:** • "*...right now we have a siren warnings every year, or every half a year*" (P1); • "*…two times in the year we have warning with siren, but it's not good prepared. People don't know when it will be and how long it will be and so on…*" (P13); **Nothing has happened since 1962:** • "*And since 1962 nothing has happened really major, so…*" (P2); • "*And it was in 76 there was a flooding and in 78 as well and but it didn't… quite high water level. But it didn't flow over, just till the top*." (P4); • "*Low threat. The last great flood was in 1976 or 78. It was 7*	*clear water afterwards.*" (P24); • " *And you can hear in the news that there are these anniversaries. And they always tell about Wilhelmsburg and of the flood.*" (P27); • "*The next year is the 50 years aniversary of the flooding catastrophe. I think there will be some actions to remember. Big images put to some buildings and after the party these images are torn down and you can forget it again.*" (P28). **History books - autobiographies, biographies, etc.:** • "*No. I was, well, because of that I was reading a lot. I was reading just recently the book of Loki Schmidt, who is the wife of the former chancellor Helmut Schmidt, and he was the sort the crisis manager when the flood happened and that was interesting, to hear from this point of view a little bit, how he and she, as the people here in Hamburg, who were politically active and who had to make decisions, how they experienced*." (P3); • "*That was in 62. I have read much, seen much. It was a huge catastrophe and many people died and many became homeless.*" (P22). **Local folklore:** • "*Yes, Wilhelmsburg, yes. The foreigners, I don't really know. But all the old-Wilhelmsburger know that when seagulls gather here, when they gather on the roof tops, on market squares then a storm is coming. But a big one, hurricane and so on. Then the older ones know, all together upstairs! But the younger ones 'Well, that is stupid, made up.' But the elderly, I got it from them. Try to notice, when the seagulls sit here, then it's gonna be windy. Then it'll be gusty.*" (P4). **Old stories & songs:** • "*So there was a song about Wilhelmsburg 'Ueberall is Wasser und man kommt nicht dran'. Everywhere is water, but you cannot go to the water, because there were fences and there was industry in between and the people don't know, they know, but they see it not in their daily life that there is waters is.*"

	Environmental clues	Memoria
	metre something high, but the dikes were already 8meter high, this is why it didn't cause trouble" (P18); **Home built on a [Warf] mound:** • "*My home it was, the place of my birth, than was on a mound* [Warft]. *The old houses, farmers' houses they were built on little hills.*" (P4); **Nature & Weather clues:** • "*When seagulls gather here, when they gather on the roof tops, on market squares then a storm is coming...Try to notice, when the seagulls sit here, then it's gonna be windy. Then it'll be gusty.*" (P4); • "*Everytime when there is a storm, it's always like a warning signal to be cautious.*" (P5); • "*I would know. I noticed when the weather is like that. I know what weather is* [chuckles] *what... yeah, if you're a seaman you know that. So whenever there is a weather when I think there could be a flood coming I look it up on the net.*" (P7); • "*… of course, global warming* (H) *… We already have conditions like in the tropics, sometimes.* (W)". (P9); • "*I'm feeling the different weathers much more than in other parts of Wilhelmsburg. I'm feeling the nature here, the power of the water and often I say, I'm living near the North Sea, a part of the North Sea.*" (P13) **Emergency preparedness drills:** • "*This I can't…I know that they always do drills. They just did a drill…*"(P10); **Wettern [small drainage canals]:** • "*But through the Wettern, the little flood, little rivers,... therefore the water will go out from the ground to the Elbe but in the same way it comes from the Elbe to middle of Wilhelmsburg.*" (P13). **Family built an upstairs to avoid another flood:** • "*My mother-in-law…when she rebuilt again, the house had to*	(P13); • "*You know, I like the old stories of the dike and the North Sea and things like that...Just you know like fairy tales? You know for example Der Schimmelreiter, it's by Fontane, Theodor Fontane. There was a guy who kind of gave his life to save the people from the flood on a ship and he rode on a white horse across the dike and then warned people and things like that.*" (P15). **Roads names for old dikes:** • "*Wilhelmsburg was not, you can see the history of floods, when you go through the streets and look and the streets, who have the name dike. For instance Vogelhuettendeich or Niedergeorgswerderdeich, in really there were different island in Wilhelmsburg and some were surrounded by dike and other not.*" (P13).

	Environmental clues	Memoria
	have stairs so that she didn't have to live on the ground level, she was always afraid of flooding." (P14). **Old furniture has flood damage marks:** • Furtniture shown to interviewer during interview. **Wet basements:** • "*We still have wet basements*" (P19); • "*Basement needed to be pumped out, or belongings have to be protected in plastic containers*" (P24). **Flood damage marks on walls in rooms:** • "*I know that our house was affected. My flat, I live on the ground floor, was affected. And there was damage in the walls which are there until today*." (P19). **Flood gates:** • " *the sluice gates enforce the dikes protection*" (P18); • "*What I know is, when the flood gates in the Grosse Elbstrasse are being closed and the cars are under water in the Elbstrasse* [in HH]" (P19). **Prepared (pre-filled) sandbags:** • "*the only part of Germany we have filled sand bags…nearly…80 000 sand sacks…*"(P20). **Living in a lowland area:** • "*it's a lowland area*" (P22). **Container storage on Wilhelmsburg:** • - "*There is a container storage close to Wilhelmsburg and I just would be afraid that because of the flood containers will become loose and would be transported over the whole island. And if such a container hits a house, I don't know what would happen.*" (P11)	

Table B.6 Informants' 'knowledge of the flood history' of Wilhelmsburg; table lists main categories identified under this theme relative to informant groups (immigrants, New & Old Wilhelmsburgers, and Students).

Categories	Immigrant	New Wilhelmsburger	Old Wilhelmsburger	Student
Do not know	• "*I hardly know anything about it*" (P17);	• "*I wasn't there, no idea*" (P18); • "*nothing, I know that it was flooded once, maybe 10 years ago*" (P21).		• "*I've no idea, really not at all*" (P15); • "*I don't really know*" (P12).
Other storm surges		• "*I remember the floods and I think it was 74, there were a lot of floods in that winter, but I was living in Blankenese*" (P7); • "*the one in 1974 was higher but didn't overtop the dikes*" (P11); • "*And there was a flood in 1976, too. It was higher than in 1962, I think 1976, maybe*." (P13); • "*The last great flood was in 1976 or 78*." (P18).	• "*In 76 many people were worried… in 78 he [her husband] had to go out and fill sand sacks with sand*" (P4).	
Date, time, year	1962;	1962;	16th , Friday (P8); 'night' (P9); 17th February 1962 (P5).	1962;
People involved	• "*the secretary for the interior back then was **Helmut Schmidt** and that he, on his own, organised it* [emergency response] *quite well*" (P27).	• "*Innensenator, the person responsible from the State and that was **Helmut Schmidt**… he got quite famous… because he dealt so very well with that situation* [1962 flood]" (P1); • "*And in the evening **we***	• "***My home** it was, the place of my birth, then was on a mound* [warft]. *The old houses, farmers' houses they were built on little hills. It was our…and the flooding was all around us. There was nothing in the flat or in the*	• "*It was **Helmut Schmidt** back then. Somehow he governed it well*" (P19).

Categories	Immigrant	New Wilhelmsburger	Old Wilhelmsburger	Student
		***went down to the Elbe**, because we had heard, that was before telephones, we heard that the Elbe didn't go down and so we went down to look… so my **parents and me** went down to look*" (P7).	*rooms. Just all around and **we were on an island**, a holm*." (P4); • "***I was just sewing** a masquerade costumes*." (P4); • "***I haven't forgotten** anything, it's all there. Like I said,I was 8 years old, turned 9*." (P5); • "***Us soldiers** were employed in Wilhelmsburg in the high water. There I came back and helped as a soldier... **Our job** was to come here to save, to help. **We did it**. And after 5 days, 6 days we left and the **civil help organisations** came and put everything back into order. We were just, from this perspective, here first, also because we were so many. The other came from elsewhere, later on. **From southern Germany**, everywhere. Also **the English helped**, **the Americans helped, the Dutch**. Everyone came here, **the military***." (P8); • "***my father lived here** in the flood in the*	

Categories	Immigrant	New Wilhelmsburger	Old Wilhelmsburger	Student
			Reiherstieg, the old Wilhelmsburg." (P8); • "***I was on the road going dancing***, *yes. And I came home late, at 10. And then the sirens went off...*"(P9); • "***We were gathered upstairs*** *and the next day came the army with assault boats and they let us climb out of the window and drove us to the museum. That is located on a hill.*" (P9); • "***I just experienced*** *it as a small child, I don't have any memories and we also lived in the old Wilhelmsburg that... the house where we lived in, it obviously was under water and* ***my father*** *brought his car to a safe spot so it wasn't in the water.*" (P14); • "***I was in my mother's womb*** *in that time.*" (P28); • "*And* ***my parents history*** *is,* ***my father had a new car.*** *That was a big thing in 1962 to have a car. And my parents... They lived here in the Vogelhuettendeich, just around the corner. So they*	

Categories	Immigrant	New Wilhelmsburger	Old Wilhelmsburger	Student
			woke up. They heard thing happening, they got to know that the dikes are broken, were broken." (P28).	
Locations affected	• "*Vast parts of Wilhelmsburg under water*" (P17).	• "*Water was about one and half metres here in the streets* [Veringstrasse]" (P3); • "*the dike broke in the Spreehafen [marina], there where the toll fence is opened…it ran and Wilhelmsburg west, that's the port area of Wilhelmsburg was affected the most*" (P10); • *"...also detached houses in Kirchdorf*" (P10).		

Table B.7 Informants' awareness and views on the implications of the flood history in Wilhelmsburg; table lists main categories evident in data relative to informant groups (immigrants, New & Old Wilhelmsburgers, and Students).

Categories	Immigrant	New Wilhelmsburger	Old Wilhelmsburger	Student
Dikes heightened	• "*the dikes were raised in time…*" (P17).	• "*they made the dikes higher, and also they made some laws* [prohibiting building on dikes]…" (P3).	• "*Now the dikes are as high as 8.5m to 9m*" (P8); • "*now they* [the dikes] *are raised to 8m*" (P25); • "*interest in the dikes has improved*" (P20).	
Social	• "*It was a huge catastrophe and many people died and many became homeless*" (P22).	• *"…many houses which were built after the second World War... garden houses and they are living, and many of*	• *"…Many people lost everything or had high damages and they were traumatised*" (P14).	

Categories		Immigrant	New Wilhelmsburger	Old Wilhelmsburger	Student
			this died in this" (P13).		
Point of change			• *"…A real turning point of the whole, of this place…some people left and the life this part of town… have never returned to it as it did. It never normalised into it's own way, business life, cultural life and whatever.*" (P2).		• "*that the district was given up as a residential area and as a result Kirchdorf Sued was built*" (P19).
Trust			• "*After that, I think people are really trusting the government in that. I think he* [Helmut Schmidt] *played a very vital role in that*" (P1).		
Other preparedness measures		• "*There is the Deichwacht and there are different people who always take care and watch over the dikes*" (P17).	• "*due to that fact new buildings have Stufen, sind nicht mehr ebenerdig {stairs, aren't levelled anymore}, due to the fact of the flood, buildings who have been built after the flood has been a little bit higher with the Stufen, with the Treppe* [stairs] *and well, not much more*" (P16).		• "*afterwards I think they really modernised everything* [flood protection]" (P12).
Damage	***human (intangible)***	• "*I think even three, four hundred people died*" (P17); • "*It was a huge catastrophe and many*	• "*big flood which cost many lives...."* (P2); • "*62 is the only flood where really a lot of people were dying...*"	• *"…many people lost everything… they were traumatised*" (P14); • "*323 people of Wilhelmsburg are going*	• "*Huge bunch of people killed*" (P12);

Categories		Immigrant	New Wilhelmsburger	Old Wilhelmsburger	Student
		people died and many became homeless" (P22); "many died" (P27).	(P7); • "*Around 300 people lost their lives…*" (P10); (P11).	*dead…*" (P20).	
	physical (tangible)	• "*Vast parts of Wilhelmsburg under water*" (P17).	• *"... which destroyed a lot.*" (P2); • *"... a lot of people were dying, and not just people there were a lot of animals drowning then*" (P7); • *"some people lost everything."* (P10).	• *"…many people lost everything or had high damages...*" (P14).	• "*the district had flood damage which you can see until today*" (P19).

Table B.8 Informants' awareness and views on the causes for the historical flooding in Wilhelmsburg; table lists main categories evident in data relative to informant groups (immigrants, New & Old Wilhelmsburgers, and Students).

Categories	Immigrant	New Wilhelmsburger	Old Wilhelmsburger	Student
Dikes broke	• "*its possible that the dikes theoretically might break again…*" (P17)	• "*So I know the first dike that went was over there*" (P7); • "*the dike broke in the Spreehafen*" (P10);	• "*Dikes very low back then…*" (P25); • "*dikes poorly made*" (P28*);* • *"people using the dikes to live on and grow their vegetables*" (P28); • "*the dikes... too low, 5.2m, and also old nearly 100 years old*" (P8).	
Social setting/conditions		• People living in garden houses (P13), • people living in post World War 2 conditions & housing (P2, P3, P13);	• *"… the perception wasn't as if you would be threatened here, the citzen said, 'high water comes and high water goes'* " (P8)	• "*many people died in provisional post-war houses*" (P19)

Lack of warning		• "*People surprised & unprepared*" (P13); • "*warnings didn't reach district in time*" (P10); • "*I think that the system of warning hasn't worked or there wasn't a system in place*" (P1).	• "*In 1962 people didn't get warned in time, they didn't have the chance to evacuate*" (P14).	
Lack of information & awareness		• "*And a lot of people would live there but these were in flood danger. But they didn't know. I think people just didn't know.*" (P1).	• "*In 1962 there was no information and no media culture like we have now*" (P14).	
Heavy storm surge			• *"…there was a really heavy storm surge here*" (P14); • "*the storm was already for 24hours and it became stronger and pushed the water from the North Sea in the Elbe*"(P8).	

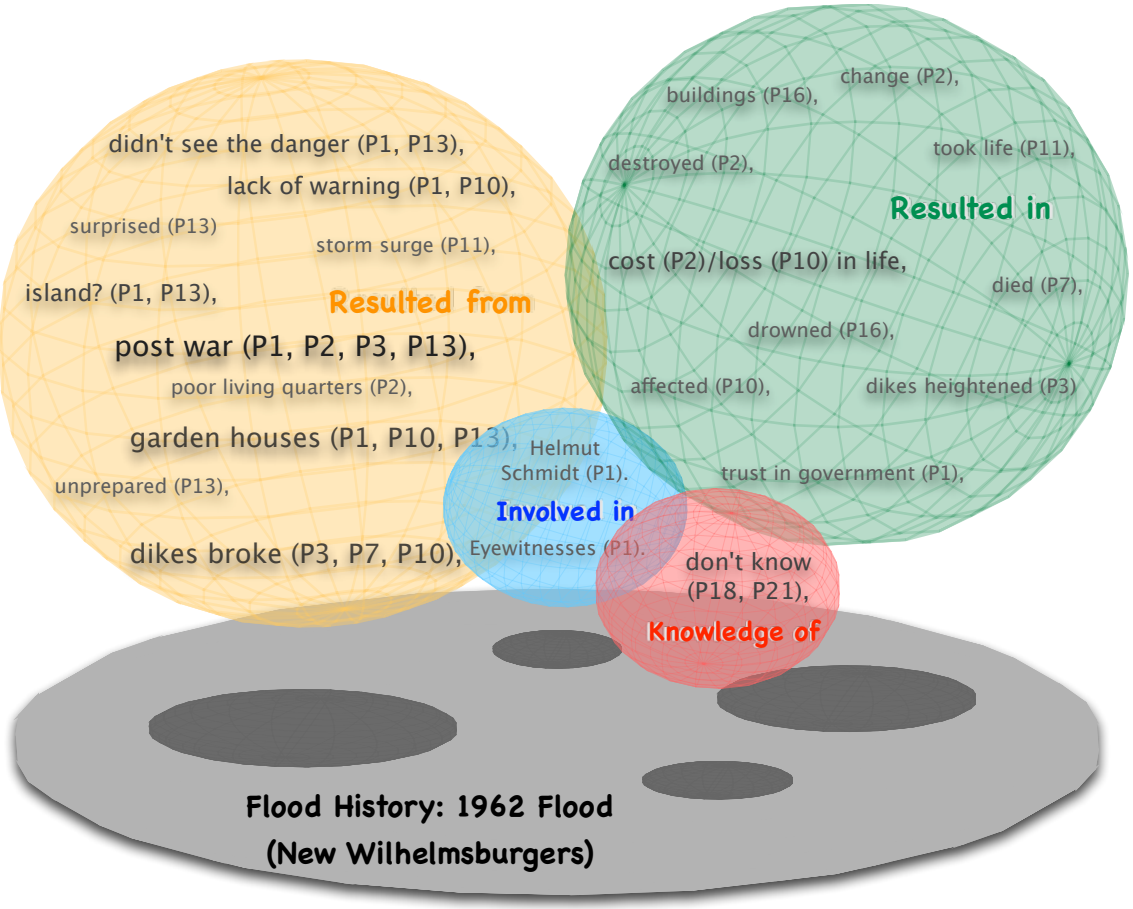


Figure B.16 Code plots of New Wilhelmsburgers' reported historical awareness, in terms of the semantic relationships: 'resulted from' (causes - green sphere); 'involved in' (who - blue sphere); 'knowledge of' (red sphere); and 'resulted in' (implications - yellow sphere). Size of spheres represents prominence in group (i.e number of members from the group provided information within semantic relationship, the larger the sphere the more prominent the knowledge around that relationship). Bracketed 'P' numbers indicate informants who shared the coded point.

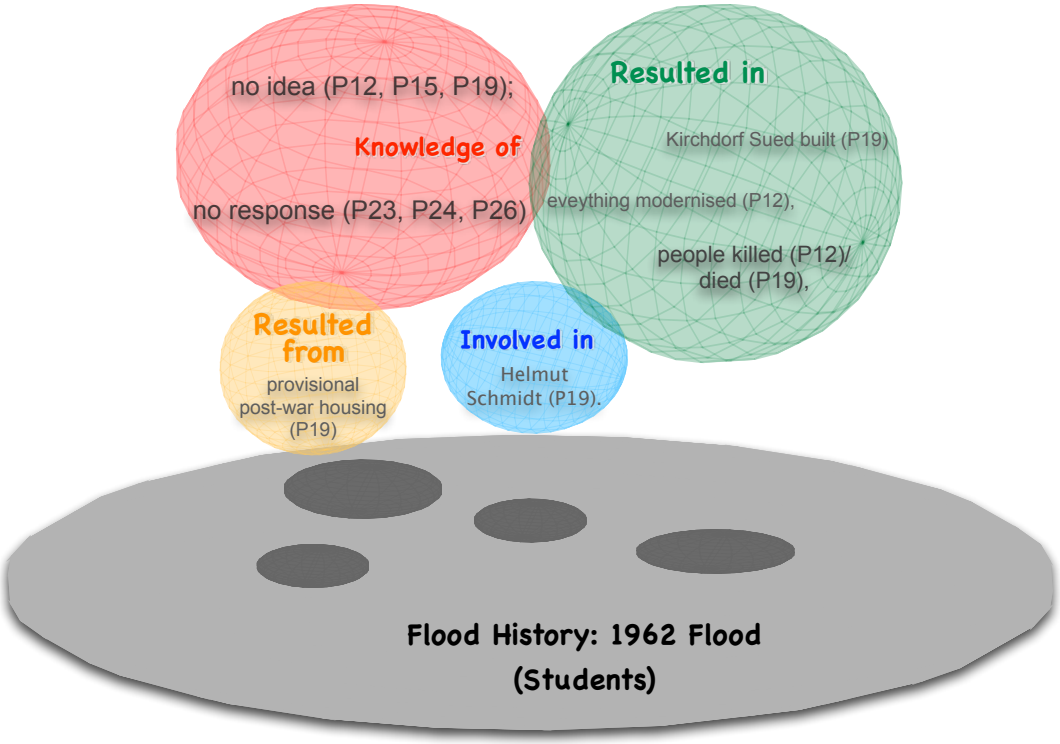


Figure B.17 Code plots of Students' reported historical awareness, in terms of the semantic relationships: 'resulted from' (causes - green sphere); 'involved in' (who - blue sphere); 'knowledge of' (red sphere); and 'resulted in' (implications - yellow sphere). Size of spheres represents prominence in group (i.e number of members from the group provided information within semantic relationship, the larger the sphere the more prominent the knowledge around that relationship). Bracketed 'P' numbers indicate informants who shared the coded point.

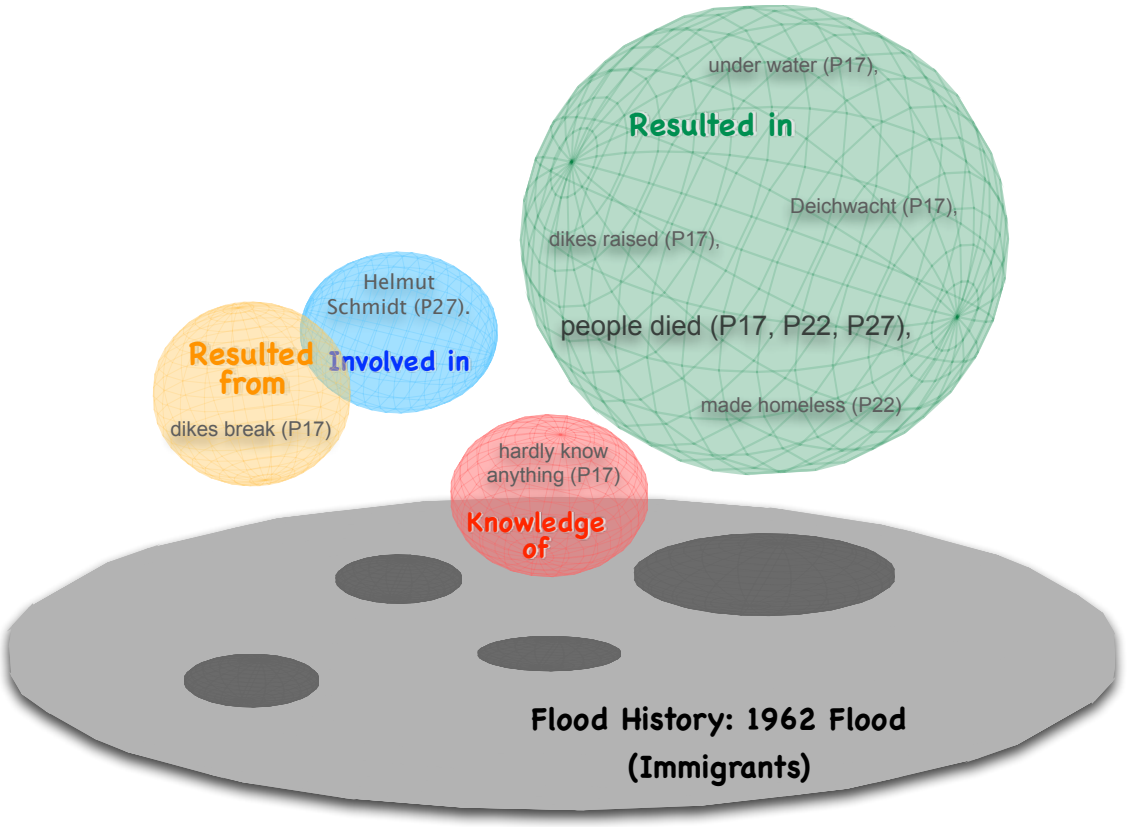


Figure B.18 Code plots of Immigrants' reported historical awareness, in terms of the semantic relationships: 'resulted from' (causes - green sphere); 'involved in' (who - blue sphere); 'knowledge of' (red sphere); and 'resulted in' (implications - yellow sphere). Size of spheres represents prominence in group (i.e number of members from the group provided information within semantic relationship, the larger the sphere the more prominent the knowledge around that relationship). Bracketed 'P' numbers indicate informants who shared the coded point.

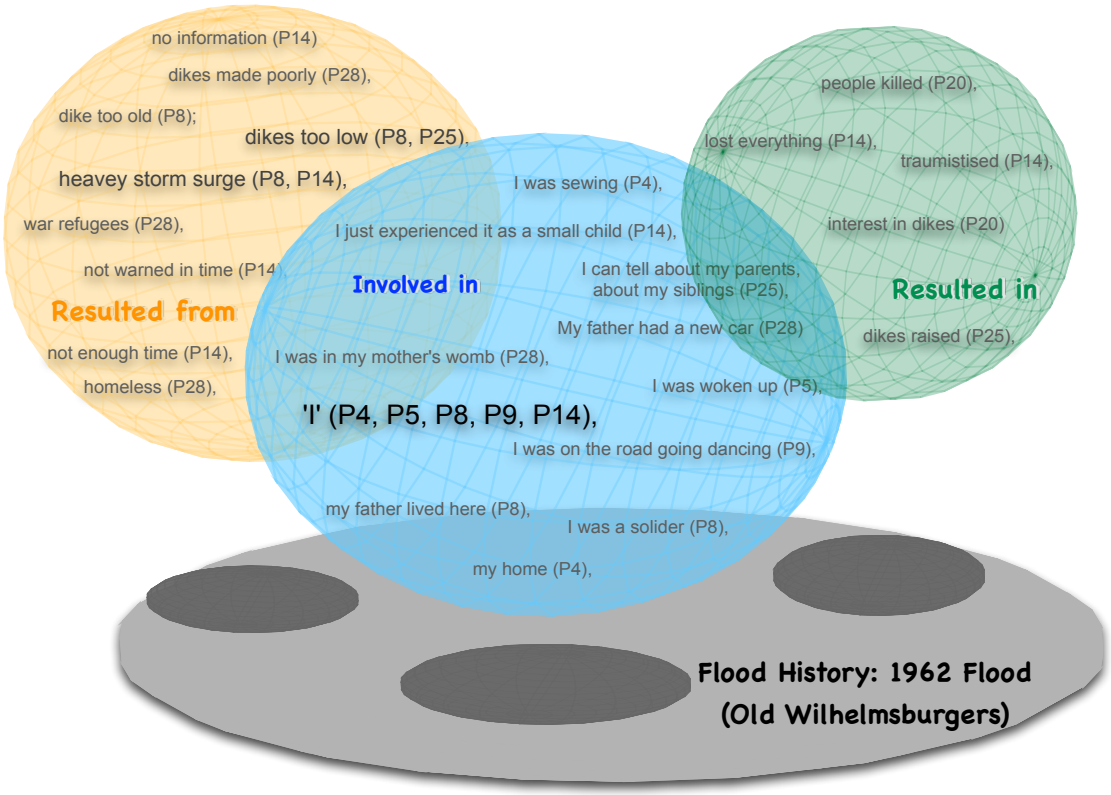


Figure B.19 Code plots of Old Wilhelmsburgers' reported historical awareness, in terms of the semantic relationships: 'resulted from' (causes - green sphere); 'involved in' (who - blue sphere); 'knowledge of' (red sphere); and 'resulted in' (implications - yellow sphere). Size of spheres represents prominence in group (i.e number of members from the group provided information within semantic relationship, the larger the sphere the more prominent the knowledge around that relationship). Bracketed 'P' numbers indicate informants who shared the coded point.

B.7 Photos of Wilhelmsburg

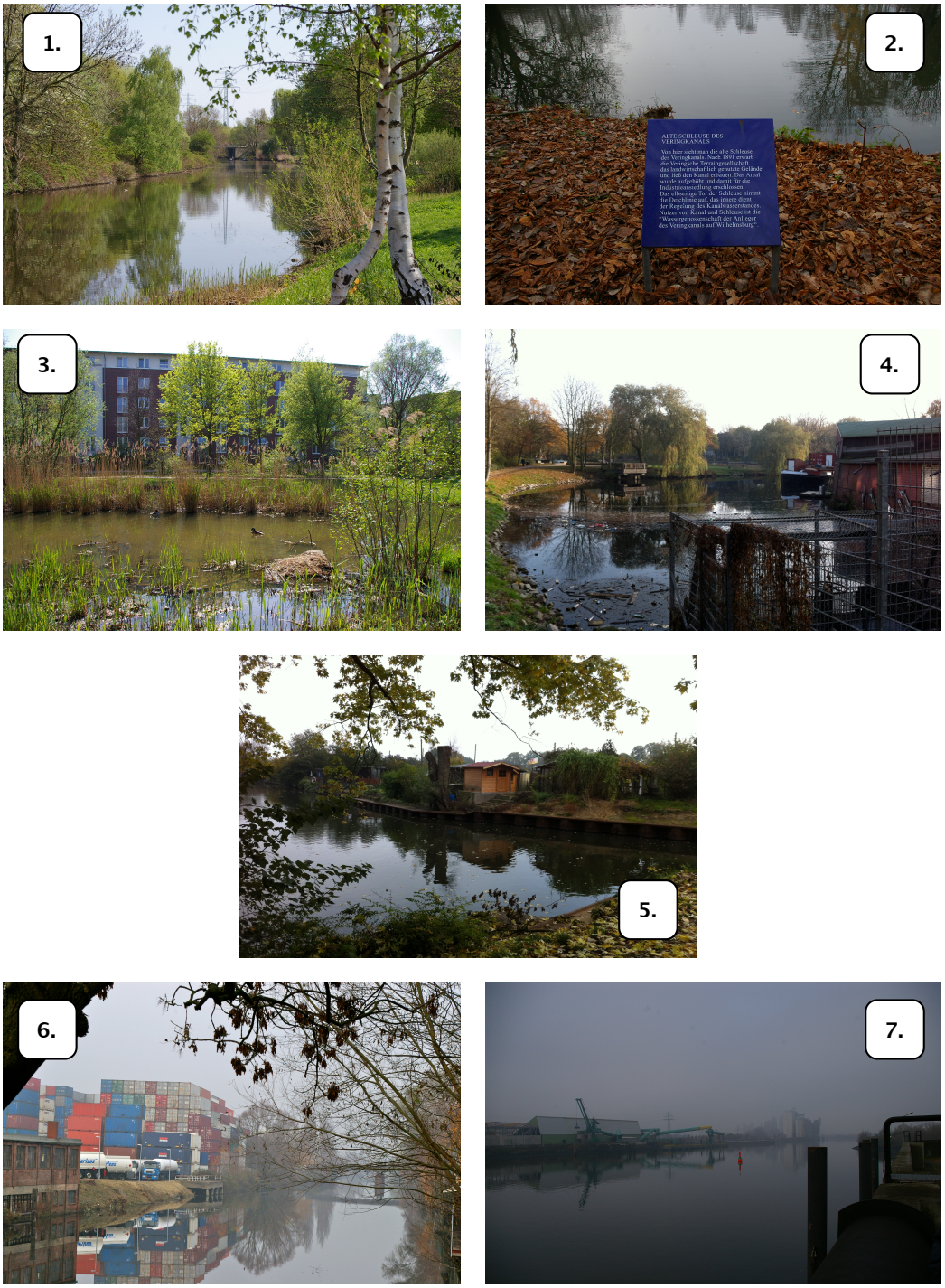


Figure B.20 Situational environmental clues in Wilhelmsburg: 1. Ernst-August Kanal north of Reiherstieg; 2. Historical sign on the Veringkanal detailing the role canals played in forming the area; 3. Wetland (Schulgraben) near Ernst-August Kanal north of Reiherstieg; 4. End of Veringkanal near the Honigfabrik (honey factory, restaurant & social spot; 5. Aßmannkanal with garden houses on opposite bank near Kirchdorf; 6. Container storage area near Reihersteig (potential risk during floods); and 7. North Elbe with harbour on opposite bank.

Figure B.21 Situational environmental clues in Wilhlemsburg: 8. The meeting of the north and south Elbe near Moorwerder; 9 & 10. Nature awareness centre at the confluence of north and south Elbe near Moorwerder, provides information about rare and endemic fauna and flora to the Elbe estuary.

Figure B.22 Flood marks memorising how high the 1962 flood came on different streets in Reihersteig. 11. Mark on Fährstraße west and translator; 12. Mark on Veringstraße; 13. Mark on Fährstraße east and translator.

Figure B.23 Dikes at different corners of the island. 15. Hauländer Hauptdeich (South west of the island); 16. Klütjenfelder Hauptdeich (north of island, parallel with Harburger Chaussee); 17. Custom fence behind the Klütjenfelder Hauptdeich; 18. Moorwerder Hauptdeich (south of island).

Figure B.24 Signs to do with the dikes. 19. Deichmarker (dike marker); 20. Sign notifying that you are in a dike area; 21. Depot for dike repair.

Figure B.25 Road signs showing the streets named for the old and new dikes (22,23 &24). 25. A hairdresser named 'Deich Friseur' (Dike Hairdressers).

Figure B.26 Other structural flood defences. 26. Flood gate at Veddel station closed, 27. Flood gate at Veddel station open; 28. Flood wall (south west of island).

Figure B.27 Bus stops indicating a flood evacuation pick up point.

Appendix C: Chapter 5

C.1 Badda, Dhaka City: a community well acquainted with floods

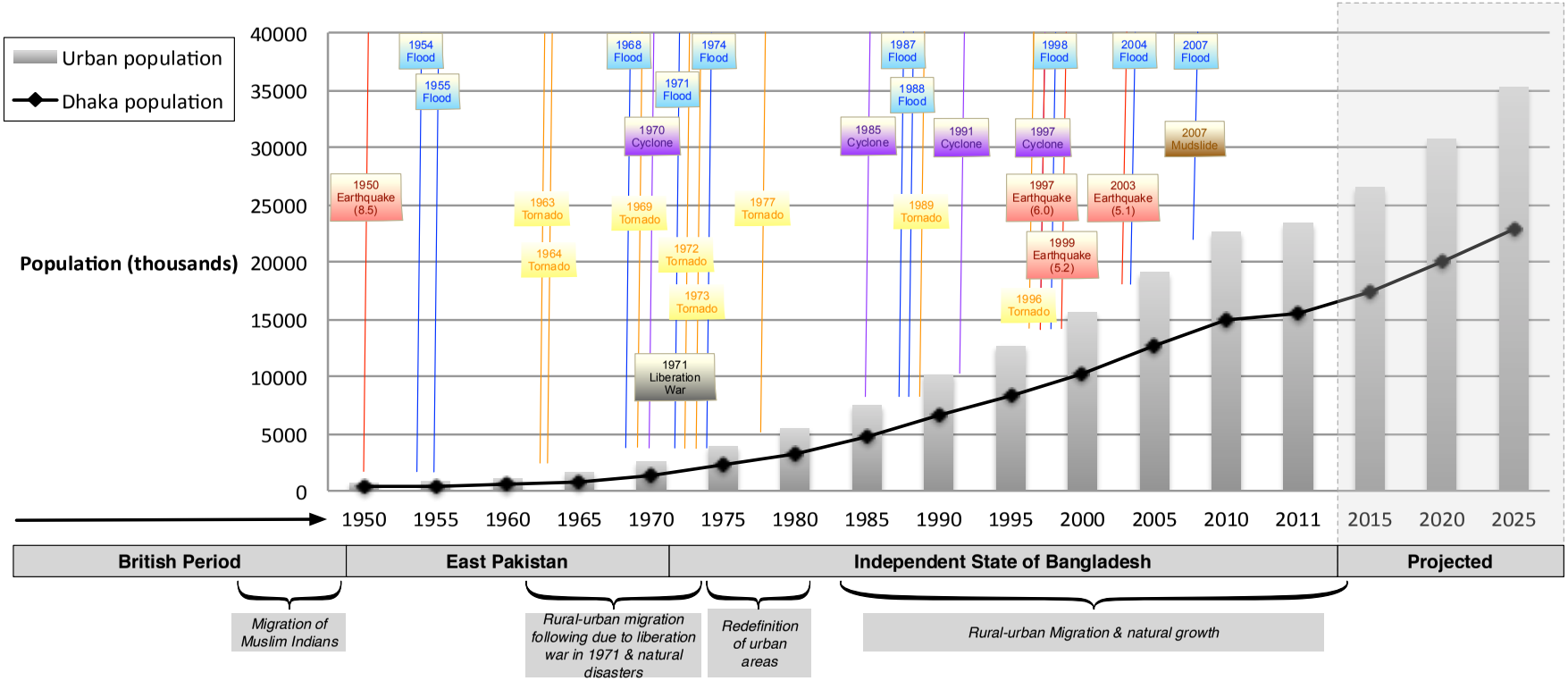
C.1.1 Bangladesh: urbanisation through the ages and in the midst of disaster

Situated on the Granges-Brahmaputra-Meghna Delta (the world's largest delta) in Southeast Asia, Bangladesh has the precarious honour of being one of the most disaster prone countries in the world. With recorded incidents of: flooding, earthquakes, cyclones, tornados, riverbank erosion, droughts and anthropogenic hazards such as poisoning of underground water (Horwood, 2007), Bangladesh's legacy of disasters has made it a site of dynamic, diverse and catastrophic events (Figure C.1; Table C.6). These events have helped shape the current urban and rural landscapes and have played important roles in the development of local culture and social life.

The urban centres of Bangladesh have had a somewhat stop-start urbanisation history (Hossain, 2006). Growth pre-1950 was characterised by plagues, famine, floods, war, and the migrations into and out of the urban centres these initiated (Hossain, 2006; Hossain, 2008; Islam, 2012). In 1901, under British rule, urban growth in the areas currently known as Bangladesh was almost static, with only 2.43% of the area's population living in areas then classified as urban (Hossain, 2008; Islam, 2012). This increased up to 8.8% between 1911 and 1921, however, a series of outbreaks and illness during this period caused decreases in urban populations. Although slow growth post 1921 did occur, fears associated with World War II resulted in many fleeing the urban areas, only to return later due to drought and famine in rural areas (Hossain, 2008; Islam, 2012).

When the Indian subcontinent became independent from British rule in 1947, Bangladesh (then East Pakistan) gained a new political status. With this status, the urban areas of the small country gained new significance (Islam, 2012). Up until this point only on average 4% of Bangladesh's population lived in urban centres and the rate of urbanisation was very slow (Islam, 2012). However, after 1947 many Muslims living in India immigrated to Bangladesh, and many of these found their way to the main cities and so the rate of urbanisation began to increase.

This process really took off post 1971 when Bangladesh achieved independence from Pakistan (Hossain, 2006) (Figure C.1). Rural migrants flocked to the cities in hope of a better life after experiencing the Liberation War and the natural disasters that occurred in the time following the war (Islam, 2012). Since then Bangladesh's urban growth has gathered momentum and the UN's Population Division of the Department of Economic and Social Affairs (2011) indicates that the country's urban population has increased by more than 22 million people since 1950 (to 2011) (Figure C.1).



(Source: Ali & Choudbury, 2001; Mirza, 2003; Mallick et al., 2005; Finch, 2009?; Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat 2011)

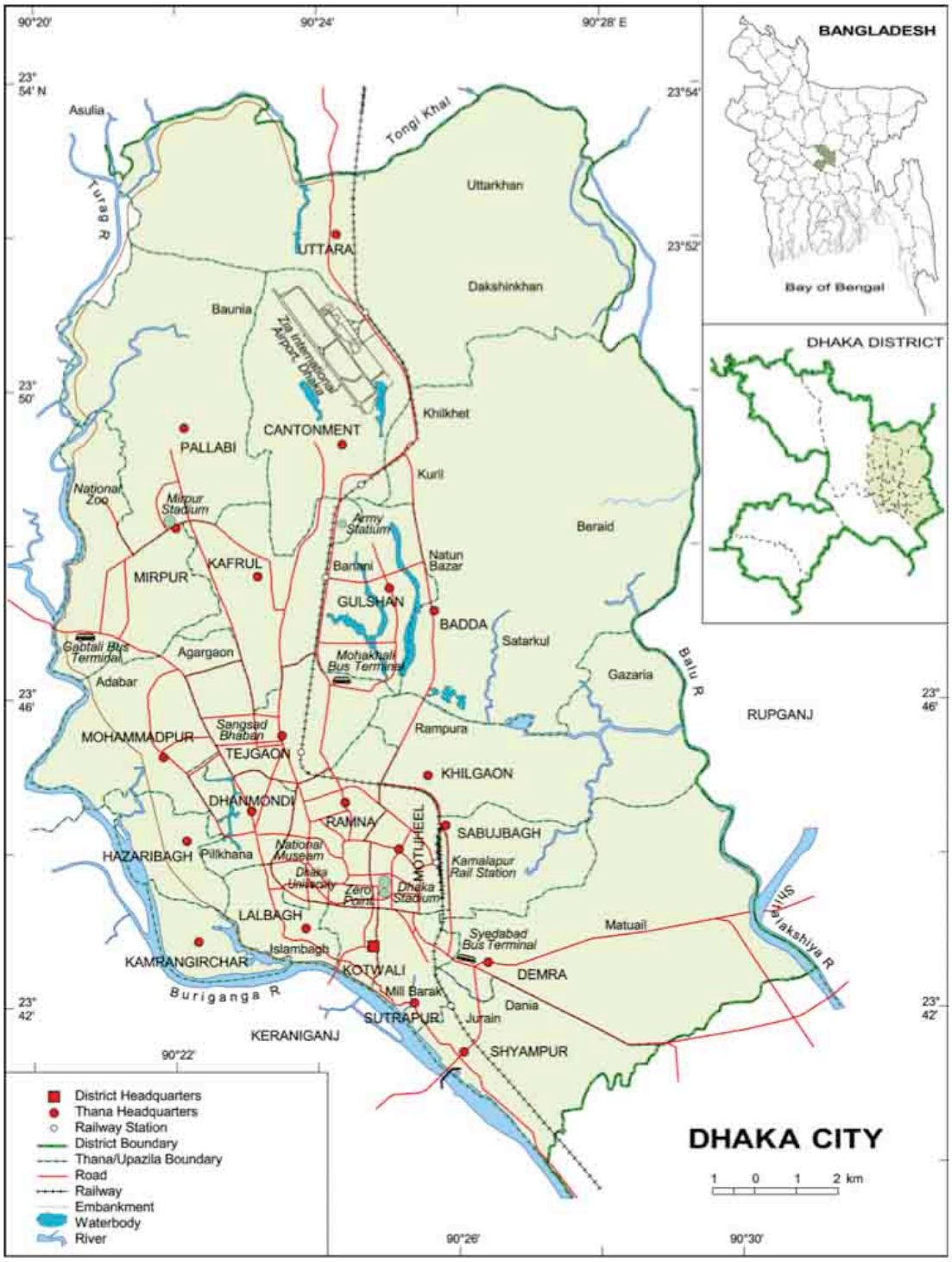
Figure C.1 Urban population of Bangladesh and Dhaka City's population from 1950 to 2011; Dhaka's population reached more that 15 million people, and it's projected to increase by another 7 and half million by 2025. Coloured markers indicate natural hazard events recorded to have happened in Bangladesh through the period (e.g. earthquake, flood, tornado, cyclone and mudslides).

Politically, Bangladesh still feels the impacts of its feudal, colonial and autocratic past (SAAPE, 2003). It appears that historically the people of Bangladesh have been struggling for liberation from one regime or another. In 1947 they got freedom from the British colonial regime, but still found themselves without independence as they then fell under the rule of Pakistan. It was only after 24 years of struggle with Pakistan and nine months of war for liberation that they achieved their own independence (SAAPE, 2003). Emerging as an independent state in 1971 the country continued to remain under military and autocratic rule until social outcry in 1990 brought this to an end and Bangladesh had its first national election in 1991 (SAAPE, 2003). Despite more democratic leadership, the ruling parties and classes have long been divided on the issue of collective identity (SAAPE, 2013). On the one side those who identify with *Bangalee* nationalism based on language, and on the other those who proclaim *Bangladeshi* nationalism based on Islamic identity and affiliation with Pakistan (SAAPE, 2013). Neither party differs much on issues of governance and both follow top-down approaches imbedded with neo-liberal capitalist economic growth ideologies (SAAPA, 2013).

The democratisation process has been repeatedly interrupted by military interventions (SAAPE, 2013) and the autocratic legacy of leadership has facilitated widespread corruption, negligence of peoples' needs and violation of human rights (SAAPE, 2003). The South Asia Alliance for Poverty Eradication (SAAPE) (2003) identifies a 'culture of silence', and ever present fear in the minds of the people limiting their responsiveness to government initiatives and as a result civil society in Bangladesh is weak and highly fragmented (SAAPE, 2013). This is particularly evident among the poorer communities (Hossain, 2006; Banks et al., 2011).

C.1.2 Dhaka City: a growing mega-city

Dhaka City is the capital city of Bangladesh, and the main site for this small country's political departments and government. Situated in the centre of Bangladesh in the Dhaka district (Figure C.2), the city (Dhaka Metropolitan Area, DMA) is nestled between four major rivers and waterways: the Turag on the west, the Buriganga on the south, the Balu on the east and the Tongi Khal on the north (Figure C.2). Given that Dhaka City has developed within this circle of rivers, urban life in Dhaka has had to be interwoven with their dynamics and impact (Mowla, 2013), and the people and authorities actively adapting to the hazards they pose (Faisal et al., 1999).



(Source: Chowhury, n.d.)

Figure C.2 Dhaka City (Dhaka Metropolitan Area, DMA) in Dhaka district, central Bangladesh.

Interestingly Dhaka has been ranked the second worst city in the world to live in by the Economist Intelligence Unit's livability survey (2013). It is a city characterised by extreme inequality, housing is a problem, and the provision of services and infrastructure like electricity, gas and fuel supply, water supply,

sewage and sanitation, and waste management, are sketchy and unreliable (Hossain, 2006). Provision of social services like health care, education and recreation are weak, and largely unavailable to the urban poor (Hossain, 2006; World Bank, 2007). The high concentration of people leads to traffic congestion and high levels of air and noise pollution. Added to this, the frequency and severity of floods (fluvial, pluvial and from urban sources) and the problems they pose to city dwellers can make life in Dhaka uncomfortable and precarious (Faisal et al., 1999; Horwood, 2007; Ishtiaque, 2014).

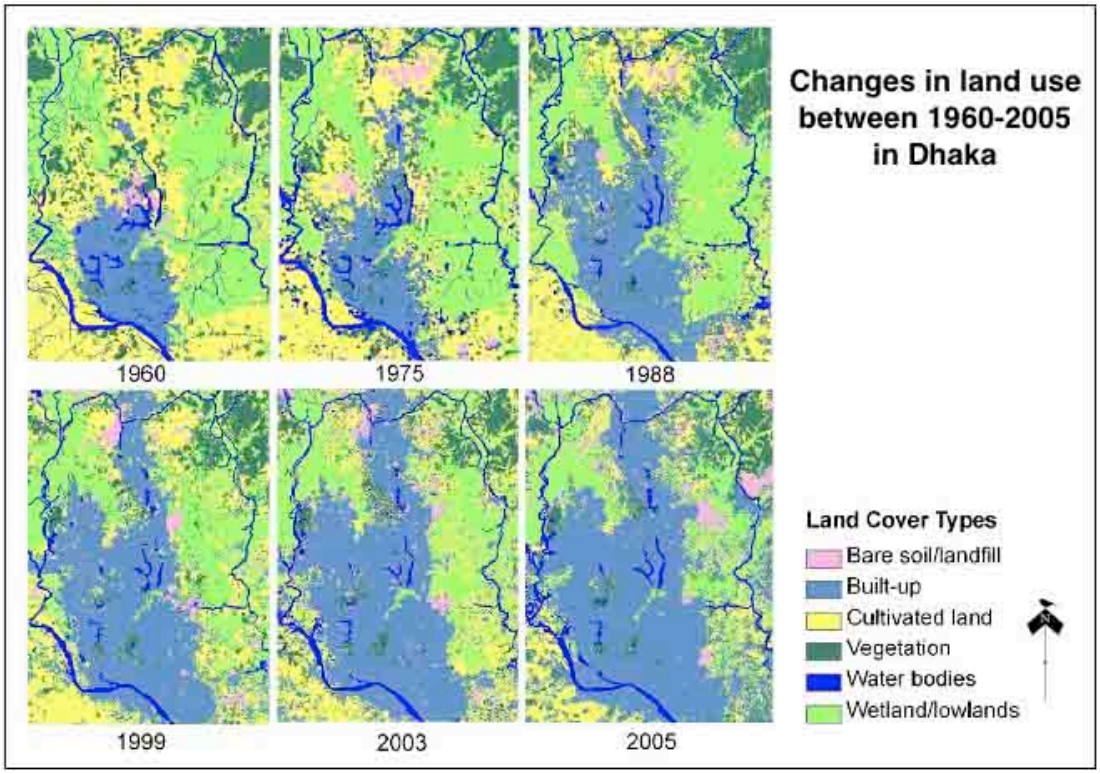
Urbanisation & growth of Dhaka

The Mughal Emperor Jahangir historically established Dhaka in 1608 on the banks of the Buriganga River (Huq & Alam, 2003). In 1947 Dhaka became the capital of East Pakistan and with this it quickly established the prestigious status of being the administrative, commercial and educational centre of the country (Hossain, 2006). This new status not only attracted Muslims immigrating in from India, but also an onrush of people from the surrounding rural areas (Hossain, 2006). Today Dhaka is one of the world's fastest growing mega-cities (urban area with a population bigger them 10 million people) (Haque et al., 2010; Demographia, 2014), attracting an estimated 300 000 to 400 000 new migrants (mostly poor) annually (World Bank, 2007). Dhaka's population has increased by over 15 million people in the last 60 years (UN the Department of Economic and Social Affairs, 2011); this is estimated to increase by a further 7 and half million by 2050 (Figure C.1). Much of this growth is attributed to rural-urban migration, with many rural migrants looking for better economic opportunities in the capital city, and/or relief from the impacts of natural disasters (e.g. floods) and/or processes like loss of land to river bank erosion (Ullah, 2004; World Bank, 2007; Islam, 2012).

Dhaka's attraction is intimately tied to its position as the administrative and financial headquarters for Bangladesh. Despite a 1980 government policy that sought to decentralise the administrative and economic development in the country, a disproportionate concentration of industrial and public sector investments have been made to the city (PDC, 2006). One important sector is that of the ready-made garment industry in Bangladesh, of which more than 80% is based in Dhaka following significant investment in the 1980s (ISFD, 2011). In addition to this Dhaka accounts for 80% of all national enterprises, 100% of jobs related to rubber production are situated in Dhaka, 97% of furniture production, 96% of publishing, 84% of footwear manufacture, 82% of leather goods production, and 72% of electrical machinery production (PDC, 2006). The growth of these industrial structures in Dhaka, has been supported by the presence of most of the country's main banking services, international commerce, business and export functions (PDC, 2006). In addition to this educational, cultural and research activities are also largely concentrated in Dhaka City (PDC, 2006). All of which places Dhaka as not only being the oldest and largest city in Bangladesh, but also the most centrally positioned and most well connected in terms of transport linkages with other parts of the country and the world (PDC, 2006). As such Dhaka attracts migrants from all over the country, these migrants fall into two distinct populations, those who come to

stay (permanent migrants) and floating populations of migrants composed of thousands of daily commuters and circular migrants from nearby rural districts (PDC, 2006).

This mass influx of people has stimulated unprecedented growth of the city on several levels (i.e. industrial, commercial, administrative, infrastructure and services, roads, water supply, sanitation, sewerage), which have in turn resulted in largely uncontrolled expansion (Hossain, 2006; Ishtiaque et al., 2014). Much of the topography around Dhaka makes expansion difficult, and development in the past has tended to be limited to the areas of higher elevations (6-8m asl) (Ishtique et al., 2014). However, in the last decade development in low-lying areas has been achieved through the filling up of these areas with sand (Figure C.3). This has meant that Dhaka's expansion has pushed into the floodplains and low-lying areas to the east and northeast, previously made up of wetlands, agriculture and vegetation (Figure C.3) (Dewan & Yamaguchi, 2009).



(Source: adapted from Dewan & Yamaguchi, 2009)

Figure C.3 Land cover changes from 1960 to 2005 for Dhaka City

Consequently the 'built-up' land occupied by the city has gone from occupying 11% of the total area of Dhaka (DMA) (416km^2) in 1960 to 49% in 2005 (Figure C.3) (Dewan & Yamaguchi, 2009). Where natural topography has or is preventing expansion horizontally, Dhaka's growth has, like many modern cities facing population growth, gone vertically with the establishment of high-rise buildings (Figure C.4, Figure C.11).

(Source: Birkholz, from 2012 visit)

Figure C.4 Left: land filling and building development in east Dhaka, Right: high-rise building being built in Badda, east Dhaka.

Implications for uncontrolled growth in Dhaka City

Dhaka has for the most part grown in its own haphazard manner, with little allotted time for effective city planning (Tawhid, 2004). The urbanisation process has been driven largely by unplanned private initiatives and bottom up actions that have demonstrated little understanding or concern for environmental consequences and sustainability (Huq & Alam, 2003; Mowla, 2013; Ishtiaque et al., 2014), or social needs, rights and dynamics (Hossain, 2006; Banks et al., 2007; World Bank, 2007). The long-term impacts from urbanisation that does not consider the geomorphology of an area include: water logging, pollution, changes to the hydro-geological system, land subsidence and building collapse (as seen on the 13th May 2013 with the garment-factory that collapsed in Savar, killing 1129 garment workers) (Mowla, 2013). In terms of social long-term impacts, poverty, civil unrest, and high levels of vulnerability to natural and anthropogenic hazards head up the list.

Social Conditions and poverty

The industrial investments in Dhaka may be responsible for most of the [urban] jobs in Bangladesh. The city, however, is characterised by large slums, poor housing, excessively high land prices, traffic congestion, water shortages, poor sanitation and drainage, irregular supply of electricity, unplanned construction, increasing air pollution, and poor urban governance (World Bank, 2007). 30% of Dhaka's population lives below the poverty level[67] with most living in informal settlements (Haque et al., 2010). All of which carry implications for law, order, standards of living and vulnerability to hazards.

[67] Poverty level (or poverty threshold or line) is the minimum level of income considered adequate in a particular country, in Bangladesh the national poverty level is US$2 per day.

At a government level, the lack of co-ordination and planning between the various (between 16 and 40) agencies involved in the planning, maintenance and governance of Dhaka City, as well as the absence of a comprehensive policy on urbanisation and urban poverty, has resulted in significant gaps in services and infrastructure (World Bank, 2007). Amongst those most affected the urban poor[68] are particularly vulnerable, as they most often lack the resources to find alternatives for meeting their basic needs. The World Bank's report on the living conditions for Dhaka's urban poor (2007), says that roughly one in three residents are affected by poverty in Dhaka. Those affected mainly live in slums situated on privately owned land, which creates difficulties and challenges in terms of basic service provision (i.e. sewage lines, public toilets, water supply) (World Bank, 2007). Poorer households tend to be made up of more people, most particularly children. There are lower levels of education and school attendance rates amongst the poor (than the non-poor), and access to social services like clinics and hospitals hampered by distance (Hossain, 2006a; World Bank, 2007).

Perceptions of poverty in Dhaka were found by the World Bank (2007) to be linked to social hierarchy. This hierarchy is established around social attributes including income and occupation, power, social position and networks. For the most part, the structure of municipal governance leaves little scope for participation by the urban poor, in fact they were only granted voting rights in 1994 (Banks et al., 2011). Prior to this only 9% of Dhaka's population were granted voting rights, based on property, income and education (Banks et al., 2011). As a result there is no real representation of urban-poor communities in local government, and they have no real power to influence decisions (Banks et al., 2011).

Due to the inadequacy of law enforcement agencies crime and violence have become a part of life for the urban poor (Hossain, 2006a). Social unrest, violence, theft, robbery, looting, murder, hijacking, arson, acid throwing on girls and women, rape of young girls, fire-arm possession, illegal rents and tolls, have gradually become a way of life for these communities (Hossain, 2006a). In general, the World Bank (2007) found that slum dwellers house a deep lack of trust in the justice system and police, and much of the incidence of crime and violence (including domestic violence against women) goes unreported. 61% of crime in Bangladesh is estimated to occur in Dhaka City (Hossain, 2006a).

Culturally, Dhaka is considered one of the most rural megacities in the world (Hossain, 2006a). Local socio-cultural characteristics of Dhaka are all representative of rural: religious perspectives, music and drama, accents and expressions, food recipes and national dress (Hossain, 2006a). Most residents are Muslim, with a few Hindu communities (again usually the poorer) being situated in the east of the city.

[68] The urban poor are those residents, who are mainly rural migrants, living in the slum and squatter settlements of the city (Rashid, 2000).

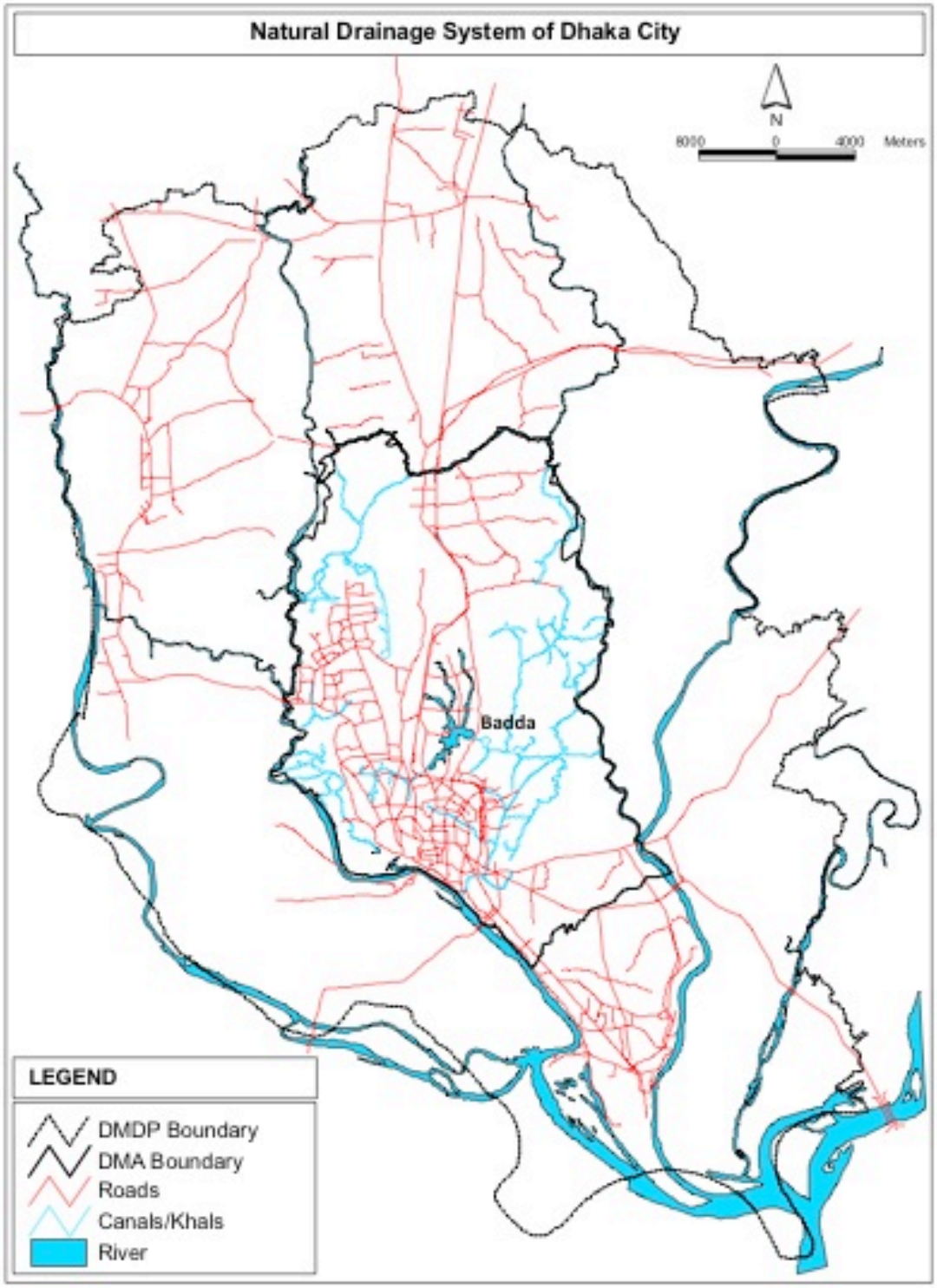
Poorer urban households are considered to be most vulnerable to events outside of their control (Rashid, 2000). They have fewer assists and resources to rely on during crisis situations, and therefore, a reduced ability to cope and respond. Urban expansion and encroachment activities in Dhaka make use of the urban-poor communities in obtaining land (Ishtiaque et al., 2014). Land grabbers and real estate developers encourage these communities into areas where they can begin claiming land not otherwise available. Most times these areas are vulnerable to natural hazards and environmental pathogens and provide the communities with few to no structures to help them cope with the consequence of these hazards.

Encroachment of Drainage system

One of the biggest issues Dhaka faces is the consequences of encroachment into the canals, ditches, lakes, ponds, and marshes/wetlands (retention areas) that make up the natural drainage system of the area, in order to build on (Tawhid, 2004; Mowla, 2013). The drainage system of Dhaka requires these canals ('Khals') and retention areas to collect the city's rainfall-runoff and discharge it into the surrounding rivers (Figure C.5). Figure C.6 shows the Rampura Khal [Bagunbari Khal], a major water drainage canal for the east part of city; Figure C.12 & C.13 show images of Banani and Gulshan Lakes in the city.

The lack of available space in Dhaka and inefficient management by city authorities means that many opportunely grab land where they can (very often with the aid of corrupt city officials), this results in the encroachment of the drainage elements of Dhaka (Mahmud et al., 2011). This encroachment is primarily being carried out by private real estate companies, that largely ignore local planning laws and claim canals by placing bamboo walls in them, and slowly filling up behind these walls with sand from other areas (Ishtiaque et al., 2014). Other encroachment mechanisms involve the building of houses, shops or even mosques on stilts in the canal, the government agencies then have little ability to forcefully move these structures (most especially the mosques), and the land grabbers will begin to build roads to these structures and thus the encroachment of the canal occurs (Ishtiaque et al., 2014). In addition to these encroachment processes, slum development - also often propagated by local political leaders who pay for the building of houses over the canals and then rent them to poor people - also take over the canals eventually (Ishtiaque et al., 2014). All of these processes usually involve the filling up of canals by dumping solid waste and rubbish (Ishtiaque et al., 2014).

In the last decade, most of the natural canals (approx. 50) have either been illegally filled by 'land-grabbers' or have become narrowed and clogged (Islam, 2004; Haque et al., 2010). Figure C.7 shows the shrinkage of wetland areas (characterised by marshy, peaty, inundated - during significant part of the year - low-lying areas of the Turag-Buriganga and the Balu floodplains) in the DMA between 1978 and 2009 (Mahmud et al., 2011). Between 1978 and 2009 a total of 76.57km^2 of wetlands and 18.72km^2 of rivers and Khals have been lost in the DMA, and the total area of drainage elements shrunk from 52% to 21% of the DMA (Table C.1).



(Source: Tawhid, 2004)

Figure C.5 Natural Drainage System of Dhaka City.

(Source: Birkholz, from 2012 visit)

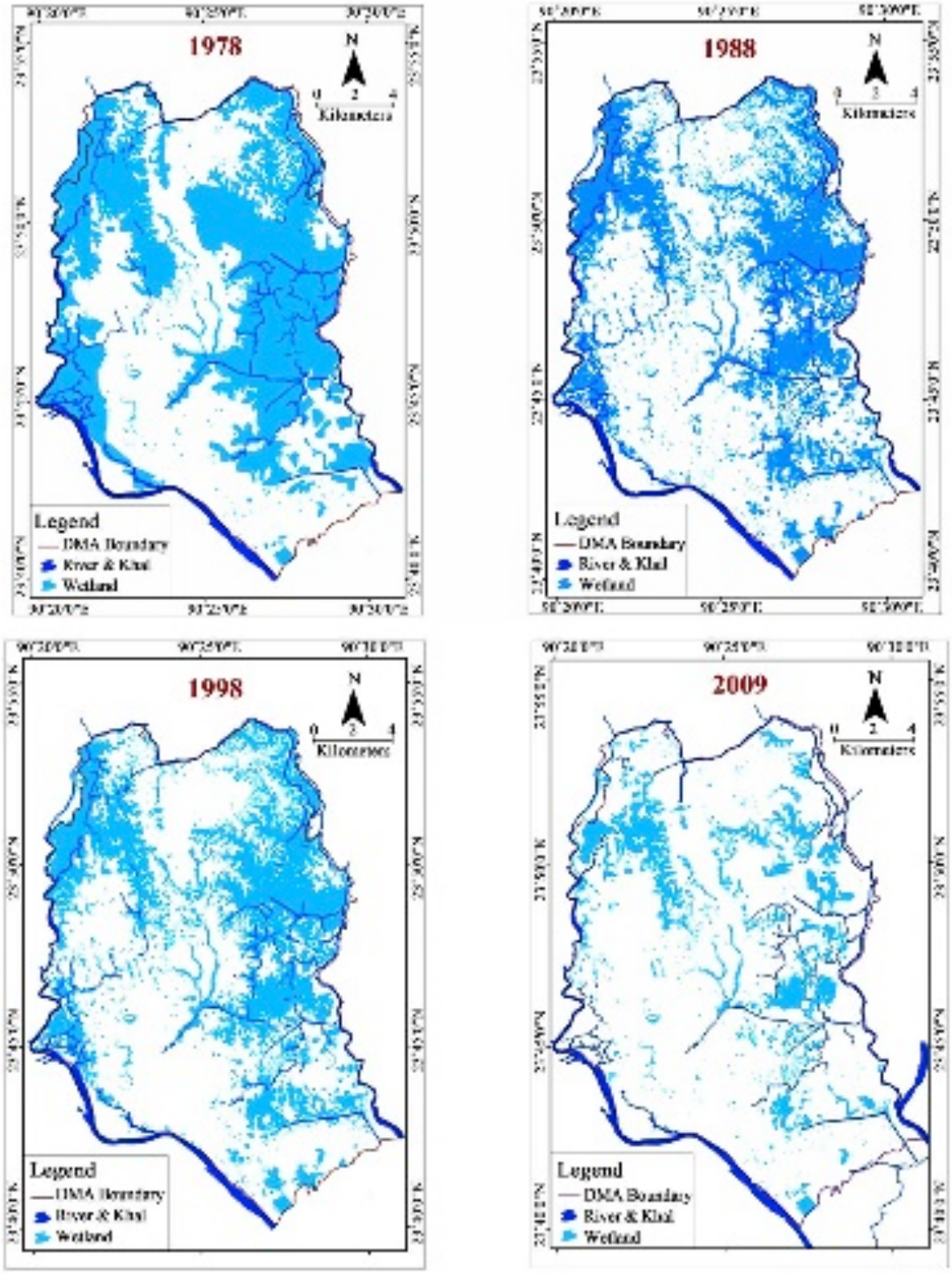
Figure C.6 Rampura Khal (canal) [Bagunbari Khal] south of Badda, east Dhaka; informal settlements (on stilts) can be seen along the banks.

Table C.1 Extent of Wetlands and Rivers & Khals (km2) in the Dhaka Metropolitan Area (DMA) between 1978 and 2009

	1978	**1988**	**1998**	**2009**
Wetland	130.17	127.85	106.93	53.6
Rivers & Khals	29	21.03	18.72	10.28
% Of DMA	52%			21%

(Source: Adapted from Mahmud et al., 2011)

Altering and shrinking the drainage system of Dhaka has implications for water logging and flooding in the city. Each year residents have to deal with acute water logging problems during the rainy seasons, indeed during the monsoons, many areas of Dhaka are inundated with water and even the main streets now go under a meter or more of water after a heavy monsoon shower (Mahmud et al., 2011). Water logging disrupts traffic and normal routines, and causes damage to: roads, houses, belongings, service lines, and trees and vegetation, and can cause illness through water pollution and propagation of water born pathogens (Box C.1).



(Source: Mahmud et al., 2011)

Figure C.7 Changes in extent of wetlands (comprising marshy and peaty inundated - during significant part of the year - low-lying areas of the Turag-Buriganga and the Balu floodplains) within the Dhaka Metropolitan Area (DMA) between 1978 and 2009.

Box C.1 Types of problems resulting from water logging in Dhaka City

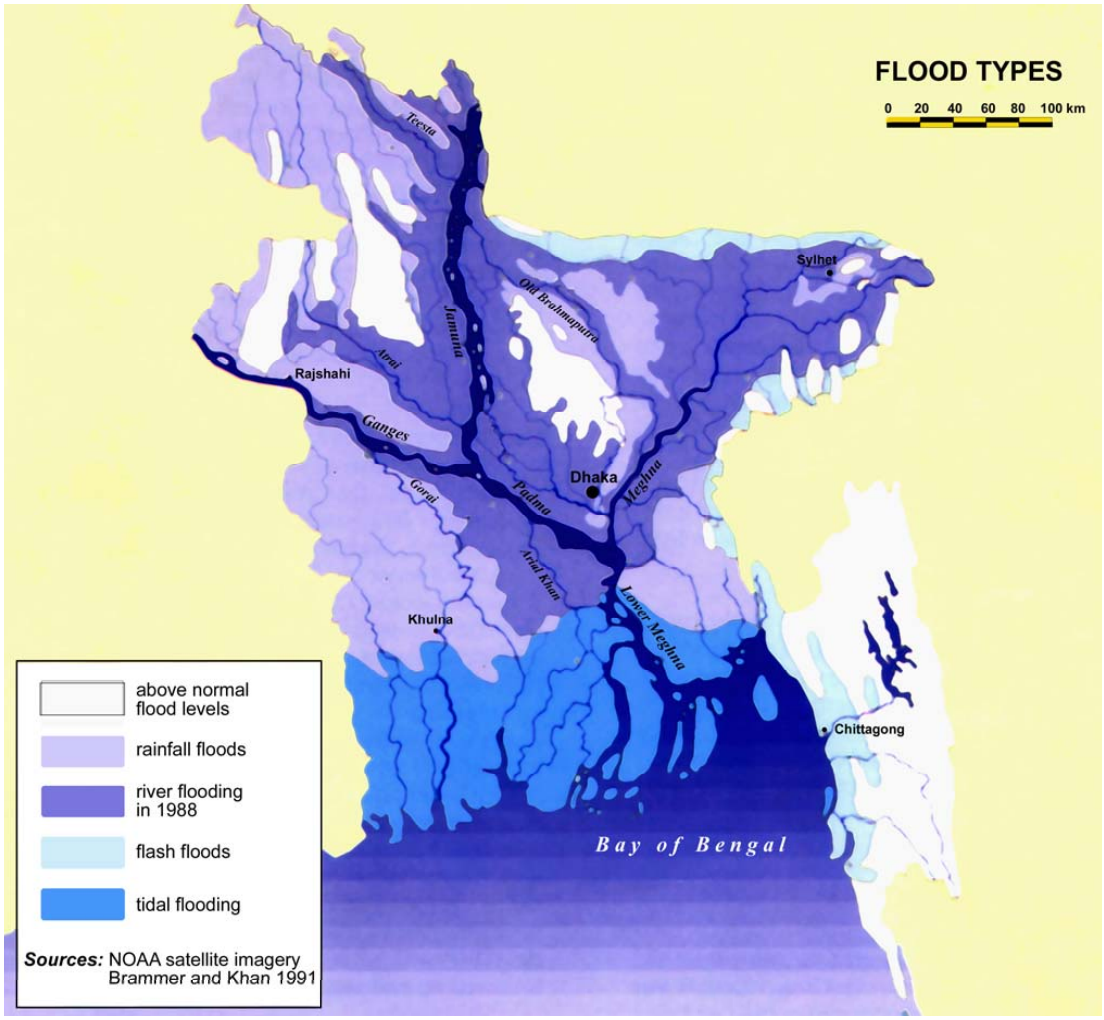
- Disruption of traffic movement;
- Disruption of normal life;
- Damage of roads;
- Damage of katcha (temporary bamboo and corrugated iron) houses;
- Damage of substructure of pucca houses (brick walls, corrugated iron roofs);
- Damage of household goods & clothes and shoes;
- Damage of underground service lines;
- Water pollution;
- Water born diseases;
- Increase in mosquito populations;
- Damage to trees and vegetation;
- Increase in construction and maintenance costs;
- Death of fish and livestock.

(Source: Adapted from Tawhid, 2004)

C.1.3 Dhaka City: Flood Legacy (History)

Flooding is a way of life to the people of Bangladesh and Dhaka. Eighty percent of the country is situated on flood plains (Figure C.8), which are submerged two to five months each year during the monsoons (Islam, 2004). Although these floods bring with them the vast amounts of silt that makes the land some of the most fertile in the world, they also bring with them high potentials for social and physical damage and devastation. The floods in Bangladesh are divided into: monsoon-river floods, flash floods, local-rainfall floods and storm-surge floods (WMO/GWP, 2003). A monsoon-river flood is an annual event caused mainly by heavy rainfall over Bangladesh and in upstream catchment areas (1988 flood - Figure C.8). Rainfall in these areas causes the water levels in the Ganges, Brahmaputra and Meghna Rivers to rise during the monsoon season, and due to the continuous nature of the rain they often do not allow for the rise in water levels to fall, thereby prolonging the downstream effects. Flash floods occur predominately in northeastern Bangladesh in the period pre- to post-monsoons (Figure C.8). They are created by intense rainfall in the Meghalaya Hills and in parts of eastern Bangladesh in the post-monsoon period. Local rainfall floods are created by heavy rainfall over a location inside Bangladesh, very often where local drainage is slow to drain it off. Storm-surge floods are a coastal phenomenon forced by cyclones hitting the Bangladeshi coastline (Figure C.8).

In Dhaka flooding is caused by three main sources: 1. Fluvial floods (i.e. monsoon river floods); 2. Pluvial floods (i.e. local-rainfall floods); 3. Urban sources (e.g. water logging & drainage congestion) (Faisal et al., 2003). In most major floods, all three play a role in exasperating the situations (Faisal et al., 2003). Since 1950, Dhaka has experienced 10 major floods these took place in: 1954, 1955, 1970, 1974, 1980, 1987, 1988, 1998, 2004 & 2007 (Figure C.1; Table C.6). The 1988 and 1998 floods still exist in local [living] memory as being the most catastrophic (Huq & Alam, 2003). Table C.2 describes the four most recent major floods (1988, 1998, 2004 & 2007) in terms of their extent, impacts and implications; and Table C.3 describes the water levels, duration, and special characteristics of the different floods.



(Source: Brammer & Khan, 1991 cited in Rahman et al., 2005)

Figure C.8 Flood prone areas of Bangladesh and associated flooding type.

The 1988 flood inundated almost two thirds of the country (Mallick et al., 2005) (Figure C.8; Figure C.10) and 85% of Dhaka City (Huq & Alam, 2003). Huq & Alam (2003) describe the flood as being one of the most severe floods, and that floods of its intensity occur only once in 70 years in Bangladesh. 60% of residents (+/- 2.2 million people) living in Dhaka were affected, and an estimated 4 billion[69] Taka[70] worth of damage was done to residential buildings (Huq & Alam, 2003). The flood cut off Dhaka's communication with the rest of the world for about two weeks, and disrupted air travel into and from the city (Huq & Alam, 2003). 2.5 million people were left stranded in Dhaka, most living for weeks with little to no food, drinking water, sanitation, shelter and health care (Mallick et al., 2005). Up until the 1988 flood, Dhaka's defence against fluvial flooding was minimal and most areas were affected during floods. After

[69] US$1=Tk32.925 in Nov 1988, at that exchange 4 billion taka worth of damage = +/- 12 million US$.
[70] £1 is roughly equal to 130 Bangladeshi Taka (April 2014).

the 1988 flood the government adopted the UN Development Program and World Bank's sponsored Flood Action Plan (FAP) to protect the city (as much as possible) from the impacts of further floods (Rasid & Mallik, 1995).

Table C.2 Recent flood history (major fluvial floods) of Dhaka City, the year, the extent of the flood, its impacts on Dhaka, and significant implications of the flood/s.

Year	Extent	Impacts	Implications
1988	• 85% of city inundated; • Entire eastern part of Dhaka & low-lying areas of the western part of Dhaka inundated.	• Disrupted city life & air travel; • Communication with Dhaka to the rest of the world were cut off for +/- 2 weeks; • 2.2 million people were affected/ 60% of city residents; • About Tk 4 billion of damage for residential buildings; • >Tk 400 million of damage to institutions.	• Lead to Dhaka's Flood Action Plan (FAP) and the 'Greater Dhaka Flood Protection Project' (GDFPP).
1998	• Almost all of Dhaka east flooded by spillover from Balu River (118km2); • 20% of western Dhaka flooded (136km2).	• Ground flood of most buildings in Dhaka east inundated; • Est. 384km of roads went under water; • Disruption of water supplies from deep tube wells & an est. Cost of Tk 127 million to repair the water supply system; • 30% of housing units in DMA damaged by floodwaters with a cost of Tk 2311 million to repair; • 32% of the damaged property belonged to more wealthy households; • 68% of damage was to urban poor communities' property; • Severe losses to business revenue through interruptions to government activities and commercial enterprise; • 4.55 million people affected by flooding; • Education system disrupted due to absence of students;	• Unemployment (high reliance on government relief, voluntary organisations and NGOs); • Water-related diseases and ill-health major problems; • Revealed weaknesses & mismanagement in the FAP, as water entered into the city through water leakage: buried sewage pipes, breached & incomplete flood walls, un-gated culverts, & inoperative regulators; • Understanding that completion of structural measures alone cannot guarantee flood protection of the city.

Year	Extent	Impacts	Implications
		• Central water supply contaminated by coliform bacteria; • Congested sewage (due to poor sanitation system) caused water borne diseases; • Air quality deteriorated, on average 50% more suspended particulate matter found in the air during the flood.	
2004	• Most of Dhaka east inundated by spill over from the Balu River. • Areas in Dhaka west affected by water logging & absence of gravity drainage; • Areas adjacent to the confluence point of the three rivers flooded. • Severe rainfall over Dhaka/ in Sep (heaviest rainfall recorded in 50 years) caused flooding in central and southwest areas of Dhaka.	• Dislocation, unemployment, lack of income, food insecurity, drinking water problems, medicine and communication; • Many slum dwellers forced to flee homes (in both river floods in July and rainfall floods in September); • Contaminated water supply from leakage of floodwater in pipelines; • Substantial damage to agricultural sector in east Dhaka; • Disruptions in electricity due to inundation of power grids.	• Identified inadequacies in flood forecasting; • Emphasis on the need for improved urban drainage and sewerage planning; • Renewed focus on constructing protection around Dhaka East.
2007	• Most of east Dhaka inundated.	• Water borne diseases prominent from people drinking contaminated water (supplied by municipality); • More [reported] cases of diarrhoea than in previous floods.	• Inadequacies of pipelines used for drinking water supply identified; • Renewed focus on constructing protection around Dhaka East.

(Sources: Faisal et al., 1999; Faisal et al., 2003; Huq & Alam, 2003; BDER, 2004; Islam, 2004; Mallick et al., 2005; Rahman et al., 2005; Islam et al., 2008; Das & Islam, 2010; Haque et al., 2010; Gain et al., 2013)

In 1998 excessive rain in the Ganges-Brahmaputra-Meghna catchment area (40% higher in July and 35% higher in August than on average) resulted in prolonged flooding in Dhaka (and the rest of Bangladesh (Faisal et al., 2003; Huq & Alam, 2003). For between 8 to 9 weeks all of Dhaka east and 20% of Dhaka west (Figure C.9) was inundated (Ahmed et al., 1999; Faisal et al., 2003). The flood resulted in widespread damage to infrastructure (384km of paved roads) and housing (30% of housing in Dhaka) (Huq & Alam, 2003); severe losses to business revenue through the disruption of government

activities (Mallick et al., 2005); schooling was disrupted because children could not come (Haque et al., 2010); and millions became sick from exposure and drinking of contaminated flood waters and drinking water (Huq & Alam, 2003). Although Phase-I of Dhaka's FAP (see next section) had mostly been completed, poor management (e.g. delayed closure of regulator gates, inadequate pumping from retention areas, lack of co-ordination between responsible organisations) and structural issues (e.g. un-gated drainage pipes and culverts, incomplete segments of flood wall) allowed flood waters to get into parts of west Dhaka, Box C.2 lists some of the causes for flooding in western parts of the city.

Box C.2 Causes for the flooding of western Dhaka City in the 1998 flood.

- Hydraulic leakage through un-gated drainage pipes and culverts;
- Delayed closure of the regulator gates at Rampura Bridge;
- Inadequate pumping from the retention storage;
- Leakage through incomplete segments of the floodwall along the Buriganga River;
- Significantly reduced drainage capacity due to accumulation of solid waste and silt;
- Lack of coordination between organizations responsible for flood control and drainage;
- Partial completion of Dhaka Integrated Flood Protection Project.

(Source: Adapted from Faisal et al., 2003)

In 2004 two different [hydrological] flood events hit the residents of Dhaka. In April, early monsoon flooding in the northwest of Bangladesh, that rose more swiftly than what occurred on average in that area, resulted in fluvial flooding in Dhaka in early July (BDER, 2004). These floods lasted for about one and half months (July to mid August), and resulted in most of east Dhaka being inundated from overflow from the Balu River (Figure C.9). West Dhaka was largely spared because of the embankments and Dhaka's FAP, however, water logging and the absence of gravity drainage caused some urban flooding behind the embankments (Rahman et al., 2005). In affected areas the flood resulted in widespread dislocation, unemployment, lack of income and food insecurity; there were problems with drinking water, medicine and communication (Mallick et al., 2005).

In mid September a localised low-pressure depression caused six days of torrential rain (10th to 16th) in central Bangladesh (BDER, 2004). In the 24-hour period between the 13th and 14th September over 341mm of rain fell on Dhaka City, this is the equivalent of a whole month's worth of rainfall in one day (Tawhid, 2004), the heaviest rainfall event recorded in 50 years (BDER, 2004). This rainfall caused another round of flooding in the city, killing an additional 19 people, isolating millions, and forcing slum dwellers to flee their homes for a second time that year (BDER, 2004). This flooding hit areas of Dhaka not hit in the previous monsoon floods, most especially in areas behind the embankments where water logging due to inadequate drainage caused extensive damage (BDER, 2004; Tawhid, 2004). In many places, including the Motijheel commercial heart, people were chest-deep in water, and much of the city was paralysed (Tawhid, 2004).

Table C.3 Recent flood history (1988, 1998, 2004, 2007) of Dhaka City, the year, water levels (above danger level), duration (time above danger level) and special characteristics of the floods.

Year	Water Levels	Duration	Special characteristics
1988	• In the Buriganga River 1.58m; • In the Turag River 2.41m; • In the Tonga Khal 1.75m; • Depths ranged between 0.3 to >4.5m in the city.	• In the Buriganga River 22 days; • In the Turag River 30 days; • In the Tonga Khal 25 days.	• One of the most severe flood in recent history (floods like this occur approx. once in 70 years); • The flood peak on the Brahmaputra was the highest ever recorded; • 85% of city inundated.
1998	• In the Buriganga River 1.23m; • In the Turag River 2.03m; • In the Tonga Khal 1.46m.	• In the Buriganga River 56 days; • In the Turag River 69 days; • In the Tonga Khal 65 days; • Lasted over two months; • Lasted +/- 65 days in Dhaka east; • Lasted +/- 30 days in Dhaka west.	• 40% higher rainfall occurred in the entire Ganges-Brahmaputra-Meghna catchment area in July and 35% higher in August than on average; • Floods continued for more than 65 days (longest flood in the history of Dhaka); • First flood after western embankment built - western Dhaka flooded by seepage through sewage lines & poor management of defence structures.
2004	• In the Buriganga River 0.7m; • In the Turag River 1.32m; • In the Tonga Khal 1.05m.	• In the Buriganga River 17 days; • In the Turag River 26 days; • In the Tonga Khal 22 days; • One and half months (early July to mid August); • Waters persisted [stagnated] in some residential and slum areas into the third week of August.	• Early monsoon floods; • Severe rainfall over Dhaka/ 341mm in 24 hours on Sep 14th (heaviest rainfall recorded in 50 years).
2007	• In the Buriganga River 0.02m; • In the Turag River 0.68m; • In the Tonga Khal 0.78m.	• In the Buriganga River 1 day; • In the Turag River 25 days; • In the Tonga Khal 29 days; • In the Balu River 20 days.	• No. of patients suffering with diarrhoea & other water borne diseases at an all time high.

(Sources: Rashid, 2000; Faisal et al., 2003; Huq & Alam, 2003; BDER, 2004; Mallick et al., 2005; Rahman et al., 2005; Islam et al., 2008)

In general the characteristics of the 2007 flood were not as dramatic as the previous three (Islam et al., 2008). Most of east Dhaka was again affected by these floods, which again highlighted the vulnerability of this part of the nation's capital (Islam et al., 2008). A significant implication of this flood was the inadequacies of pipelines used for drinking water supply, these led to the contamination of water supplies and a record number of patients being treated for diarrhoea and other water borne diseases (Islam et al., 2009).

C.1.4 Dhaka City: preparing and coping with floods

Flood defence organisations & their roles

There is no single authority for the management of wetlands in Dhaka, therefore, there is a lack of co-ordination and communication around the issue of canal maintenance and protection (Mahmud et al., 2011). Table C.4 presents the main organisations and government bodies involved in aspects of flood defence in Dhaka City. At a national level the Ministry of Water Resources (MOWR), Ministry of Land (MoL); Ministry of Disaster Management and Relief (MDMR) are responsible for policies and regulations connected with flood control & drainage (MOWR, 2014); floodplain zoning (Gourbesville & Batica, 2011a); and disaster awareness and resilience building (DMRD, 2014). The Bangladesh Water Development Board (BWDB) is the implementing arm of the MOWR, and responsible for the management of Bangladesh's water resources, this includes the maintenance of many of the regulators at the outlets of drainage channels of Dhaka City (BWDB, 2014). The Disaster Management Bureau (DMB) is the technical arm of the MDMR and overviews and coordinates all activities related to disaster management, from a national level down to grass-roots level (Gourbesville & Batica, 2011a). In addition, the DMB works at promoting disaster awareness, prevention and preparedness amongst Bangladesh's citizens, through collaborative work with district municipalities and authorities, NGOs and other key stakeholders (Gourbesville & Batica, 2011a).

Table C.4 Dhaka flood mitigation and drainage authorities.

Level	Organisation/ Institution	Responsibilities
Government of Bangladesh - GoB	Ministry of Water Resources (MOWR)	• Development & management of Bangladesh's water resources; • Prepares & implements development projects relating to: flood control and drainage; flood control, drainage and irrigation; riverbank erosion control; delta development and land reclamation; • Provides protection through the construction of: barrages; regulators; sluices; canals; cross-dams; embankments & sea-dykes along the banks of rives and the coast; • Bangladesh Water Act, 2013
GoB	Bangladesh Water Development Board (BWDB)	• Implementing arm of the MOWR; • Principle agency of the government for managing water resources in Bangladesh; • Responsible for flood mitigation & control in

Level	Organisation/ Institution	Responsibilities
		Bangladesh; • Maintenance of water bodies and provisioning of water for economic uses (e.g. Irrigation, fisheries); • Maintenance of many of the regulators at the outlets of drainage channels of Dhaka City. • National Water Policy (NWPo) 1999 & National Water Management Plan (NWMP) 2004.
GoB	Ministry of Land (MoL):	Floodplain zoning
GoB	Ministry of Defence (MoD)	Cantonment areas near and within Dhaka City
GoB	Ministry of Disaster Management and Relief (MDMR)	• Runs national risk reduction reform programmes; • Its mission is to: *'achieve a paradigm shift in disaster management from conventional response and relief to a more comprehensive risk reduction culture, and to promote food security as an important factor in ensuring the resilience of communities to hazards'.*
GoB	Disaster Management Bureau (DMB)	• Is the technical arm of the MDMR; • Established in 1993, replaced the Disaster Coordination and Monitoring Unit; • Overviews and coordinates all activities related to disaster management – national down to grass-roots level; • Works in collaboration with district and upazilla (sub-district) authorities, NGOs, and other stakeholders for promotion of disaster prevention/mitigation and preparedness; • Activities include providing guidelines, organising training and promoting the preparation of disaster action plans.
GoB	Department of Environment (DoE)	• Environment Act 1995; • Sets Environmental Quality Standards; • Prosecute through the Environment Court/s.
Administrative districts of: Dhaka, Narayanganj and Gazipur	Capital Development Authority – Rajdhani Unnayan Kartripakkha (RAJUK)	• Setup in 1953 by the Town Improvement Act • Detailed Area Plan (DAP) (2009-2010) for Dhaka City: o Intended to capture the policies and recommendations of the Structure Plan and Urban Area Plan of Dhaka Metropolitan Development Plan (DMDP); • Maintenance of Dhaka's urban environment; • Establishment of new townships, register/certify new construction and provisioning of roads, parking, parks etc.
Dhaka City	Dhaka City Corporation (DCC)	• DCC area covers about 360km2 and is spilt into 90 wards (of which 18 are reserved for women commissioners); • Responsible for licensing industrial units, solid waste management, management of open spaces (rivers, lakes, playgrounds etc,); • Responsible for the maintenances of open drains in the city; • Maintains a small part of drainage network in the south of the city.

Level	Organisation/ Institution	Responsibilities
Dhaka City	Dhaka Water Supply and Sewage Authority (DWASA)	• Established in 1963 under the East Pakistan Ordinance XIX; • *WASA Act, 1996*, gives jurisdiction to DWASA for the supply of water within greater Dhaka; • Construction, maintenance & operation of storm water drainage infrastructure (storm water and sewerage); • By 2006 DWASA had not managed to provide all of it jurisdiction with sewage lines, and as such has restricted ability to reduce water pollution.
GoB	Bangladesh Railway	Railway lines connecting Dhaka with other districts
GoB	Roads and Highways Department	Eastern Bypass, bridges

(Sources: Faisal et al., 2003; Rahman et al., 2005; Gourbesville & Batica, 2011a; BWDB, 2014; DMRD, 2014; MOWR, 2014)

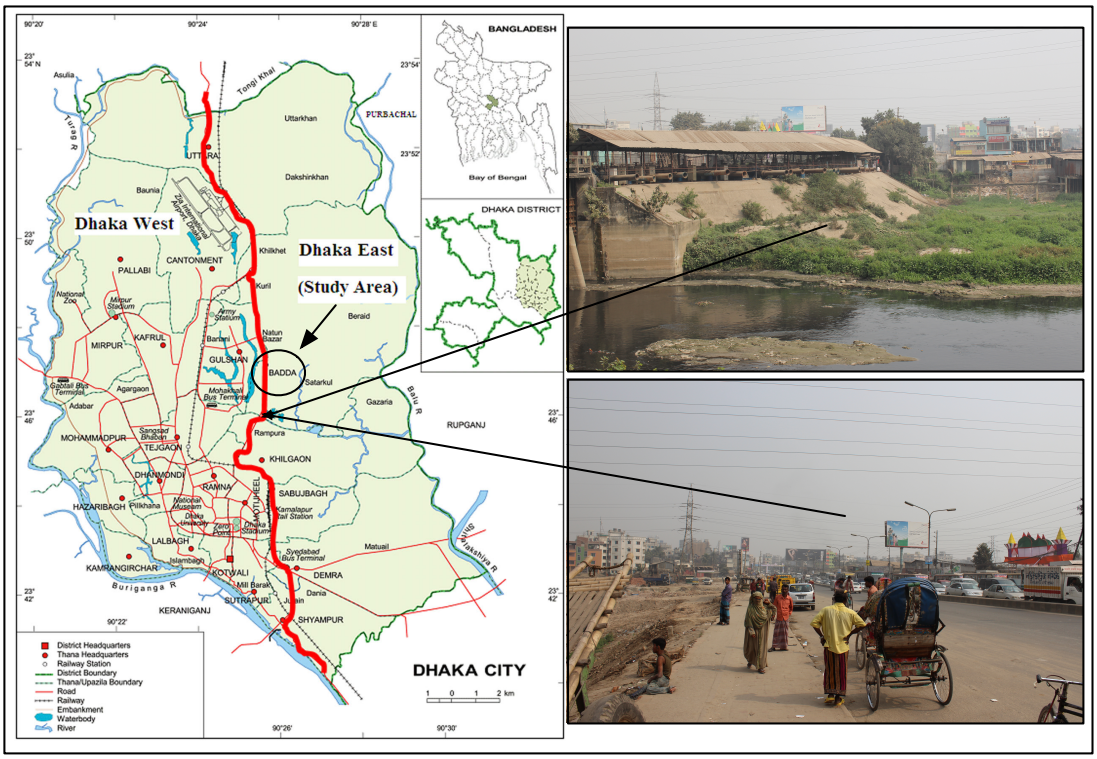
At a city level, three main authorities are responsible for urban planning, development and maintenance of storm water drains and sewerage lines, and licensing of industrial units, solid waste management and management of open spaces (Table C.4). These are the Capital Development Authority (Rajdhani Unnayan Kartripakkha - RAJUK), Dhaka Water and Sewage Authority (DWASA), and Dhaka City Corporation (DCC) respectively.

In 1998 a lack of coordination among these organisations contributed significantly towards prolonging the drainage congestion of the city (Faisal et al., 2003). For example the lack of coordination between DWASA and BWDB contributed to a month-long delay in closing the regulator at Rampura Bridge, which allowed floodwater to enter the city. In addition, deployment of pumps was also delayed, as pumps had to be brought from the Bangladesh Agricultural Development Corporation (BADC), these pumps had not been used in over a decade and many didn't work prolonging the time available for water to get in behind the embankments, and the time it remained there (Faisal et al., 2003). Another issue identified has been the absence of public involvement in operation and maintenance of control structures, as well as the lack of awareness local people have to the these structures' functions and purpose (Rahman et al., 2005). In 2004 local people attempted to open a sluice gate at Jatrabari, believing that in so doing they could lower the water level outside the gate, instead they allowed water to enter into the protected side of the gate (Rahman et al., 2005).

Flood defence in Dhaka

Dhaka's flood protection is made up of both structural and non-structural defences. Although significant thought and planning has gone into building a ring of embankments around the DMA, there have been several implications of this strategy. Embankments have been the main route most Bangladeshees take in trying to protect important infrastructure and property. These either are used to raise infrastructure like roads and railways up above potential water levels, or act as barriers against floodwaters getting into certain areas. The first

embankment in Dhaka was launched in 1864 and completed in the 1880s. Located along the Buriganga River it was contracted to protect Dhaka from river flooding and erosion and give the riverside a 'facelift' (Huq & Alam, 2003). Very little else, in terms of structural flood defence was developed for Dhaka, however in the wake of the 1987 and 1988 catastrophic floods the government of Bangladesh was forced to prepare an urgent flood protection and drainage plan (the Flood Action Plan - FAP), a core part of this was the 'Greater Dhaka Flood Protection Project' (GDFPP) (Rasid & Mallik, 1995; Huq & Alam, 2003; Islam, 2004) or Dhaka Integrated Flood Protection Project (DIFPP) (Faisal et al., 1999). This plan would work at enclosing the DMA with flood embankments, re-enforced concrete walls, and drainage/flood regulation structures like sluices and pumping stations (Huq & Alam, 2003). The GDFPP was designed in two phases, Phase-I focused on protecting west of the city, and Phase-II covered the eastern floodplains and then agricultural perimeter of Dhaka City (Figure C.9) (Chowdhury, 2003). Phase-I began in 1989 and was completed in 1992; Phase-II has yet to be started (Chowdhury, 2003).



(Source: map Gain & Hoque, 2013; photos Birkholz, from 2012 visit)

Figure C.9 The Western and Eastern areas of Dhaka Metropolitan Area (DMA). Photo show the Pragoti Saroni Airport Road (thick red line) that acts as the divide between west and east Dhaka; top photo shows the embankment the road is built on, bottom photo shows the road from the top of the embankment. Circle indicates the area informants live, Badda.

The 1998 flood was the first major flood to occur after completion of Phase-I, and although almost all of east Dhaka was flooded, only 20% of west Dhaka was inundated (Faisal et al., 1999), indicating that the GDFPP was somewhat successful in protecting west Dhaka from floodwaters (Das & Islam, 2010).

However, floodwater did enter this part of the city through hydraulic leakages (buried sewerage pipes, breached and/or incomplete flood walls, un-gated culverts and inoperative regulators) and poor co-ordination between authorities (Das & Islam, 2010). Unfortunately, although the GDFPP (Phase-I) has helped in reducing some of the impact of the 2004 & 2007 floods, it has also resulted in new problems for Dhaka, Box C.3 list some of these problems as identified by Chowdhury (2003).

Box C.3 Types of problems resulting from the 'Greater Dhaka Flood Protection Project' (GDFPP).

- Rapid change in agricultural land to residential land-use;
- Severe flooding problems inside of the embankment;
- Affected the overall agricultural activities in the area;
- Disrupted the movement of fish;
- Reduced the ground-water recharge which has lead to the establishment of stagnant ponds inside the embankments;
- Forced changes to existing drainage channels;
- Increased the magnitude of floods outside the embankments;
- Created a serious problem for solid waste disposal, agricultural residues, drainage, surface and ground water quality, fisheries, public health and water transport.

(Source: Adapted from Chowdhury, 2003)

Dhaka's FAP has been severely criticised, because of it high reliance on structural defence measures. Many social scientists point out that preparation of the plan was lead by engineers, and did not consider the input or needs of the different communities living in Dhaka, nor seek their participation in the planning (Islam, 2004).

Insurance

A number of insurance companies exist in Dhaka: Jeebon Beema, Meghna Life Insurance, Green Delta Insurance, Delta Life Insurance, Pioneer Insurance to name a few (Gourbesville & Batica, 2011a). However, these companies mainly provide insurance on life, personal health, accident, fire, burglary, industrial risks, machinery breakdown, vehicle, aviation, and marine cargo, and not disaster insurance (Gourbesville & Batica, 2011a). Natural disaster related insurance in Bangladesh and Dhaka is still in the planning stages (Gourbesville & Batica, 2011a).

Non-structural activities utilized by different groups & organisations.

The nature of floods and the urban environment of Dhaka means that non-structural flood activities are diverse and utilised by a number of different social units (i.e. individuals, groups of people, households, NGOs and the Government of Bangladesh –GOB). Faisal et al. (1999) summaries some of the activities that the different social units use in flood preparedness, response and recovery activities, their information is presented in Table C.5.

Table C.5 Non-structural flood preparedness, response, & recovery activities practised by different social units

Activity	Description	Social Unit: organisations, communities, individuals etc.
Emergency services	• Medical care (water born diseases, snake bite, etc.), potable water, food, candles, fuel, clothing, temporary housing, shelter. • Widely practiced. • Usually limited to accessible places.	Hospitals, DWASA, Red Crescent, GOB, NGOs, Defense forces, Political groups & general public.
Flood proofing & preparedness	• Raising the plinth level of the house, building on tall pillars, flood walls along properties, raising important roads and some power stations above the 1988 flood level, special embankment for the international airport. • RAJUK has proposed minimum ground elevations for the eastern part of Dhaka City.	Individuals, some businesses, some industries, & GOB.
Flood fighting	• Temporary floodwall (brick or sand bags), pumping, moving assets to upper floors, roof or dry places such as high roads and embankments. • People try to fight floods till they are forced to evacuate.	Individuals, some businesses & industries.
Flood evacuation & shelter	• Community centers, schools, colleges, public buildings, roads, embankments. • Facilities used as shelters are not designed as such and do not have sufficient capacity.	Flood victims, community volunteers & emergency service providers.
Recovery & reconstruction	• Vulnerable group feeding, food for work, building materials, soft or interest-free loans for business and agriculture. • Affected group have very limited access to such help. • Pilferage of relief and rehabilitation material or fund.	GOB, NGOs, banks & private initiatives

(Source: Adapted from Faisal et al., 1999)

Non-government Organisations (NGOs) represent a significant group in helping improve flood-vulnerable communities' resilience to floods, by teaching them prior to the floods to save and prepare for floods, provide relief during a flood and support in the recovery of floods (Paul, 1997). In terms of reaching the poor, NGOs have long been considered more effective agents of development than government agencies (Dias, 1993). However, during a discussion with a representative of ActionAid Bangladesh, it was reported to the author that most development work this and other NGOs in Bangladesh focus on is in the rural areas, as they are considered more vulnerable to the impacts of floods than urban communities (pers comms, Actionaid Bangladesh, 2012). As a result not much research exists yet on the actions of NGOs in helping poor urban communities to prepare and resist the impacts of floods. With awareness around the risk urban communities in Dhaka live with in regards to not only flooding but also earthquakes, focus is shifting to include urban areas into NGO

development interests and agendas. The one NGO that was identified that had done previous work with urban-poor communities in Dhaka, was Food for the Hungry (fh) Bangladesh, this organisation had worked with local communities in Badda developing a community-based organisation (pers comms, fh director, 2012). This work had involved capacitating (teaching to read, count, do basic arthimatic, budget, manage, organise) local participants in better managing their livelihoods and resources. This included helping them to better prepare for floods, and supporting them in distribution of relief during them. It was with participants from this community-based organisation based in Badda, east Dhaka, that interviews were undertaken.

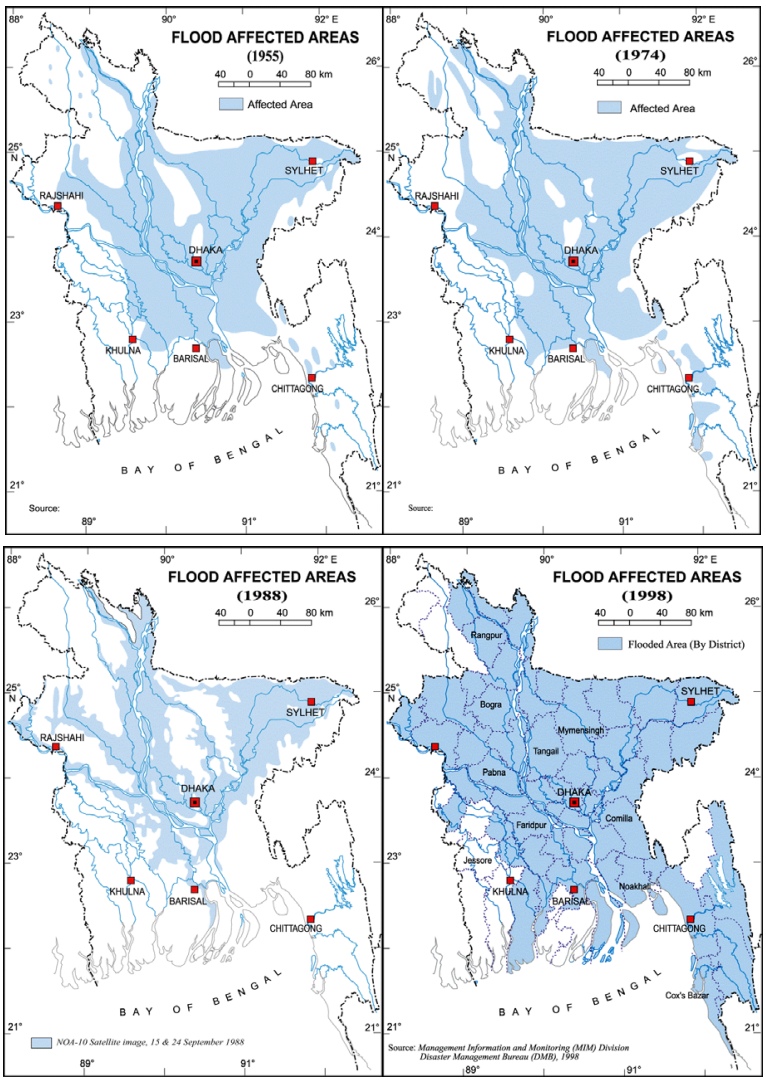
C.2 Disasters in Bangladesh

Table C.6 Disasters in Bangladesh between 1950 and 2011, shaded events had an impact on Dhaka City.

Date	Disaster	Location	Impacts	Reference
15 August 1950	Assam Earthquake (magnitude of 8.4)	Assam, India	(magnitude of 8.4) Tremor felt in Bangladesh but no damage reported	Ali & Choudbury, 2001
19 April 1963	Tornado	Northern tip of Bangladesh	>139 people killed	Finch, 2009?
03 April 1968	Tornado	Begumganj in southeast Bangladesh	42 people killed	Finch, 2009?
11 April 1968	Tornado	Naria & Bhederganj in southeast Bangladesh	141 people killed	Finch, 2009?
14 April 1969	Tornado	Dhaka & east Dhaka	600 people killed	Finch, 2009?
17 April 1969	Tornado	Central & western Bangladesh	84 people killed	Finch, 2009?
29 April 1972	Tornado	Northeast Bangladesh	<300 people killed	Finch, 2009?
01 April 1977	Tornado	Madaripur in southern Bangladesh	500 people killed	Finch, 2009?
12 April 1981	Tornado	Southeast Bangladesh	200 people killed	Finch, 2009?
14 April 1986	Tornado	Southeastern Bangladesh	100 people killed	Finch, 2009?
July & August 1987	Flood	Western side of Brahmaputra River, areas north of Khulna (36% of country inundated)	Crops severely damaged, >24 million people left homeless & starving	Mirza, 2003; Mallick et al., 2005
August-September 1988	Flood	Large areas along the Brahmaputra, Ganges and Padma and parts of Dhaka	45 million people directly affected, >2.5 million people in Dhaka left	Mirza, 2003; Mallick et al., 2005

Date	Disaster	Location	Impacts	Reference
		City (63% of country inundated).	stranded, living for weeks with little food or drinking water.	
26 April 1989	Tornado	Saturia in central Bangladesh	1300 people killed	Finch, 2009?
20 April 1990	Tornado	50 miles northwest of Dhaka	76 people killed	Finch, 2009?
07 May 1991	Tornado	Gazipur, north Dhaka	45 people killed	Finch, 2009?
18 May 1991	Tornado	Gournadi in southern Bangladesh	50 people killed	Finch, 2009?
08 April 1995	Tornado	Munshiganj district in central Bangladesh	40 people killed	Finch, 2009?
13 May 1996	Tornado	Northern & central Bangladesh	>600 people killed	Finch, 2009?
22 November 1997	Earthquake	Chittagong	(Magnitude of 6.0) Caused minor damage to Chittagong town.	Ali & Choudbury, 2001
July to mid-September 1998	Flood	Between 67-69% of Bangladesh's landmass inundated	1 million people displaced, 16 000km roads damaged, 500 000ha of crops destroyed, loss of business revenues, disruption to government activities, long-lasting unemployment.	Mirza, 2003; Mallick et al., 2005
22 July 1999	Earthquake	Maheshkhali Island	(Magnitude of 5.2) houses cracked and collapsed in some cases.	Ali & Choudbury, 2001
27 July 2003	Earthquake	Rangamati district	(Magnitude of 5.1)	Ali & Choudbury, 2001
June-September 2004	Flood	Half the country inundated, particularly in northeastern & central regions	Affected livelihoods, human settlements, employment, agriculture, fisheries, livestock, industries, all types of rural & urban infrastructure	Mallick et al., 2005
5 August 2006	Earthquake	Narail, 110km southwest of Dhaka	(Magnitude of 4.2)	Ali & Choudbury, 2001

Date	Disaster	Location	Impacts	Reference
20 March 2008	Earthquake	Manikganj 41 km northwest of Dhaka	(Magnitude of 3.8)	Ali & Choudbury, 2001
27 July 2008	Earthquake	Mymensingh 120km north of Dhaka	(Magnitude of 5.1) caused panic in Dhaka	Ali & Choudbury, 2001
20 September 2008	Earthquake	Chandpur 50km southeast of Dhaka	(Magnitude of 4.5) caused panic in Dhaka	Ali & Choudbury, 2001
21 September 2009	Earthquake	Eastern Bhutan, 410km northeast of Dhaka	(Magnitude of 6.1) caused tremors in Dhaka	Ali & Choudbury, 2001
10 September 2010	Earthquake	45km southwest of Dhaka	(Magnitude of 4.8) caused tremors in Dhaka	Ali & Choudbury, 2001



(Source: Rahman et al., 2005)

Figure C.10 Areas in Bangladesh affected by the 1955 (top left), 1974 (top right), 1988 (bottom left), and 1998 (bottom right) floods.

C.3 Photos of Dhaka City

(Source: Birkholz, from 2012 visit)

Figure C.11 Multi-storey buildings, and building construction in Dhaka.

(Source: Birkholz, from 2012 visit)

Figure C.12 Banani Lake in Dhaka.

(Source: Birkholz, from 2012 visit)

Figure C.13 Gulshan Lake in Dhaka.

C.4 Informants' attribute info.

Table C.7 Attribute information on informants in Badda.

Interviewee No.	Gender	Age	No. of ppl. in household	Children	Time lived or worked in Badda (?) (years)	Occupation	Occupation of primary earner
PB1	Female	36	6	yes	24	Sells Sarees, tailoring	-
PB2	Female	32	3 family (15-16 ppl. in house)	yes	18	primary school teacher	Textile business/readymade garment
PB3	Female	45	6	yes	12	housewife	Pulls a van-gari
PB4	Female	35	7	yes	14-15	housewife	Driver in Gulshan
PB5	Female	36	6	yes	20	housewife	Driver
PB6	Female	38	5	yes	27	housewife	Guard at CNG garage
PB7	Female	38	7	yes	30	housewife & tailoring	Rickshaw driver
PB8	Female	32	7	yes	15-16	housewife	Driver
PB9	Female	28	5	yes	All life	tailor	Driver
PB10	Female	40	7	yes	18	housewife	CNG driver

C.5 Impacts on Informants

C.5.1 Impacts to context

Table C.8 lists the different impacts flooding have to aspects of informants' 'context'. Here the term 'context' is used to represent physical aspects of an informant's life such as their property and utilities. Three sub-categories have been identified: 'water in the house', 'belongings', and 'utilities'.

'Water in the house'

The impacts that occur when water gets in their homes are observed to be of significant importance in informants' responses. When looking at the aspect of house or home, there are significant relationships between it and those who dwell in it that create a wide range of impacts. Direct tangible[71] impacts are largely encapsulated by physical damage to the property. The intangible[72] impacts are far more varied and abstract, relating to psychological trauma and fear.

To the women in this study a bad flood is one in which water gets into their homes (Table 5.8). They are accustomed to flooding of the roads and streets that accompany the annual rains and poor drainage networks, these events are hardly considered to be floods, but the infrequent floods that surpass these 'normal' events and involve water entering and rising in their homes are the true floods. Indeed within the Bengali language there exists two words for 'flood'. '*Borsha*' is used in connection with the 'normal' floods that occur annually, this word has more of a rural, agricultural understanding in that '*Borsha*' are seen as necessary and beneficial for crop growth. '*Bannya*' (pronounced Bona) on the other hand are not seen as being beneficial and do not occur annually. These are the floods that bring large-scale destruction, death and sickness with them, and the ones that for the most part invade homes. No informant used the word '*Borsha*' to describe flooding in Dhaka, and indeed there was some debate (pers. comm. while in Dhaka, 2012) as to whether the word isn't restricted now to rural areas, however, '*bannya*' was used.

Another view is in the consideration of what a house means to a person/family that lives in it, most specifically to the women in that house. In most cultures, the concept of 'home' is seen as a safe place, it provides shelter and in many respects refuge from the outside world for the inhabitants. A home also denotes territory and personal space; also through the building, decorating, cleaning, maintaining of and living in it, a home can become an innate and

[71] Tangible is seen as those impacts with measurable and physical characteristics, these usually refer to monetary amounts (e.g. damage to buildings and belongings) (Messner et al., 2007; Gain & Hoque, 2013).

[72] Intangible impacts represent those impacts which are not so easily measured and more experientially accounted for (e.g. psychological trauma or illness) (Messner et al., 2007; Gain & Hoque, 2013).

important aspect of personal identity and pride. In addition, some of the women in this study use their homes in income generation (garment and tailoring services), as such their homes are not just a space for life, but also life-sustaining activities. Therefore, when a flood invades and for a time 'takes over' their home, emotional and psychological impacts are extensive.

For the women in this study they are bound to their homes most of the day. Their cultural, religious and social norms limit their movements (usually to that which their fathers or husbands allow or enable) and describe them as carers of their homes. Their homes enable them, therefore, to fulfill their purpose as women, wives, and mothers, in that it provides the context in which they can look after their family and children, to cook for them, watch over them, and serve them. Indeed Muslim women are brought up under a faith that directs them to stay in the home, to look after their husbands and children's comforts prayerfully and dutifully[73] (Farooqi, 2010), such an intrinsic aspect of their beliefs and understanding of their roles and purposes means that anything that impacts on their ability to fulfill these edicts leaves them feeling like they are not being obedient before God, and in so doing open to His judgement and punishment - and potentially their husband's as well. Such a view of themselves has the added repercussions of impacting their sense of personal worth and esteem. One informant summed it up like this: "*When a child goes to work he gets really hungry, when he comes back he will want to eat. He tells his mum to give him something to eat. Mum can't give anything. How will she? His father couldn't go out and earn, his mother couldn't cook. Mum feels really sad when she sees the tears in her son's eyes. People of Bangladesh suffer like that when they face the flood."* (PB10). Inability to meet spiritual and cultural expectations carries social stigma and opinion (judgement) as well; within a hierarchical society encountering social disapproval carries implications not just for themselves, but their family at large (Rashid, 2000). All of this has indirect intangible implications for the informants - "*Yes, when the water comes in. Feels like everything will be lost. But that's normal to feel that way…*" (PB8).

The other reality that flooding brings is that informants found it difficult to get out of their homes to go to the market, to fetch their children from school, sell sarees, or simply socialise (Table C.8). This is because they are either existing on raised platforms within the house, making getting to the door (if still possible) difficult and potentially dangerous depending on how contaminated the water is or how many snakes are around, or because the water level outside on the roads makes travelling without a boat difficult and again dangerous (Table C.9 & C.11). Not being able to get out of the house, limits informants' ability to get food, make money, and look after their families.

Water entering into the home, is thus a source of psychological, emotional, physical, cultural and spiritual trauma, these are intangible impacts that can

[73] The Quran commands Muslim women to 'stay in your homes' in order to guard their chastity and not to flaunt their charms and beauty in anyway, and make their homes the centre of their affairs (Farooqi, 2010).

lead to suicide as one informant indicated "*When can a mother commit suicide? She couldn't take it anymore… the struggles that we were going through… so she* [PB10's mother] *committed suicide…*" (PB10). Having to live in the water has health and well-being impacts as discussed in reference to Tables C.12a & b. Not being able to get out to sell sarees or undertake other sources of income generation has financial consequences (Table C.10). Not being able to get out means they do not get much chance to meet other members of their community, or are in a position to offer help if its needed to a neighbour, or get a family member to help if needed. Having water in their house makes people vulnerable to snakes, pests and illness (Table C.9), or other hazards like rolling off the platform - "*Many people died… A girl died here… she rolled off the macha and fell in the water…* " (PB10).

Table C.8 The impacts to aspects of context (home, belongings and community) described by informants, as well as some implications for the different damage types.

Aspect of life	Impacts	Supporting Excerpts
Home/house	• Have to leave; • Have to live on the roof; • Can't get out of house due to water in the streets; • Flood water comes into house; • House damaged by flood waters.	• "*The worse day was then* [1998], *when we had to leave our house as the water level was just too high...That was the most painful experience…*" (PB1); • "*We lived on the roof, we got soap and flat rice from people. The foreigners also came to help*." (PB4); • "[why is the flood bad for you] *Because I cannot get out of the house.*" (PB2); • "*We had many difficulties, because water got inside our house…"* (PB9); • "*No it's difficult to work… When the roads are flooded it becomes difficult to drive. It's difficult to live… It's difficult to move about, it's difficult to eat…*" (PB9); • "*If the water level comes in our house… then we suffer even more."* (PB5).
Belongings	• Get spoilt by flood waters; • Get broken or damaged or lost; • Get looted or stolen; • Clothes get wet – clothes; • Have to be raised to protect belongings; • Have to be left behind &/or replaced.	• "*If the water reaches them [belongings] they get spoiled, some break and some are looted by people who loots houses on boats*." (PB1); • "*We get wet, so we have to change clothes*." (PB5); • "*A lot of them* [belongings] *got spoiled. You can't save everything. You can't elevate everything. If we lived here then we could've saved some more, but some would get spoiled for sure*." (PB9).
Utilities: Water & waste	• Tube well goes under water; • Difficult to get clean drinkable water; • Have to fetch clean water; • Bathroom (toilet) submerged; • Water contaminated by sewage & rubbish.	• "*There is no longer the opportunity to drink water from tube well, the children find it problematic to go the bathroom since the sewage floats on water… diseases occur…*" (PB3); • *"…when our tube well sinks we take a pitcher and cover long distances to get water…"* (PB5); • "*we have to bring water…"* (PB6);

Aspect of life	Impacts	Supporting Excerpts
		• "*You can see the tube well here* [photographs], *when it is under water we have no source of drinking water and we have to look somewhere else for a water source*" (PB7); • "*The water tap was on the other side of the house. When we got down in the water we got hurt many times. We had fungal attack on our feet, our feet went white* [2004]." (PB8); • "*Here the tube well sinks under water. People excrete in the water so that water is not drinkable*" (PB10).
Utilities: Electricity	• No electricity.	• "*We have to feed the children… We don't have electricity at that time… Sometimes even for one or two days… candles…*"(PB9).

Belongings & utilities

The largest impact informants associate with flooding and their belongings was the tangible damage to them because of the water, and loss of them due to theft (Table C.8). In terms of being a priority when posed with extreme situations (scenarios given during the interview, or from personal experience) informants implied that their belongings were not that important to them, relative to their children's safety and their own lives. Box C.4 lists some of the responses from informants that suggest belongings are readily sacrificed during extreme situations. Having to abandon your home and worldly possessions, knowing that they will either be damaged beyond repair or stolen has impacts, in regards to stress, fear, and inconvenience. These impacts have the potential to have long-term psychological consequences. Similarly the financial implications in the future for having to replace belongings has the coupled effect of creating future vulnerability to subsequent flood events (Wisner et al., 2004).

Box C.4 Informants' responses suggesting prioritization of life over belongings in extreme events/situations.

- *"If the situation* [scenario described to them in interview] *is that bad no one would care about their belongings. At that time* [flood is on its way] *we just want to save ourselves. We don't think about our belongings at that time.*" (PB5);
- "*I will be cautious and go somewhere safe with my family. We can worry about the belongings later. If we are alive we can get more belongings later* [after hearing that a flood was coming the next day- scenario]." (PB8);
- "*If the house is left without anyone in it things get stolen. Because at that time* [from personal experience] *no one worries about belongings everyone thinks about how to save themselves…*" (PB9).

An interesting dilemma one informant described is that in many situations belongings cannot be taken with during an evacuation because others who might be willing to provide them shelter are not able or willing to provide them shelter if they arrive with their belongings as well. She describes how leaving belongings means they will be stolen, but taking them prevents them from finding a safe place to take shelter - "*All of our belongings were here. If we left*

them, during the time of flood if someone raided our house and took everything away on boat… we won't be able do to anything… and if we left with our belongings no one would take the trouble to provide shelter for us…" (PB5). The same informant also said that when it came to getting flood warnings - "*The sooner the better* [to get warning]. *If we can know sooner, then we would be able to save more of our belongings… But if it is very sudden then that's a problem*." (PB5).

In terms of utilities, most informants have to fetch their own water from community taps, or use tube wells. These become submerged during floods, forcing them to have to seek out clean water elsewhere (Table C.8). This most often requires walking through the dirty water which carries with it high levels of discomfort and risk of contracting illness and diseases (Table C.12a). In addition the bathrooms also become submerged, making it difficult for informants and their families to keep their 'own activities' hygienic as they are forced to go to the bathroom directly in the water, or in plastic bags that they then dispose of directly into the water (personal communications, 2012). All in all the loss of access to clean water and bathroom represents impacts to the informants through discomfort, inconvenience, illness and 'disgust' and shame (Table C.8).

Another utility that is impacted by flooding is electricity supply. Although informants' 'normal' supply is sketchy at most, with informants saying they usually only get about an hours worth a day. Floods, however, mean that informants get no electricity, which for those informants that rely on electric stoves means difficulty in feeding family members.

C.5.2 Impacts to informants from secondary hazards

Secondary physical hazards are here seen as those things that present a risk to informants not from the flood directly, but that are facilitated by the flood indirectly. These hazards themselves do not include illness or health related impacts, however, could result in these impacts. The two secondary hazards discussed by informants were (Table C.9):

1. *Macha* (bamboo platforms constructed by informants to live on and/or store furniture) and bamboo bridges (see Figure 5.3 & C.14 for examples), and
2. Pests (e.g. snakes, ants).

Table C.9 The impacts in respect to addition/secondary hazards resulting from the flooding or aspects of protection built during a flood, as described by informants.

Aspect of life	Impacts	Excerpts
Macha & bridges	• Fall through gaps of bamboo bridges; • Bridges break; • *Macha* collapse; • Fall off *Macha* & bridges.	• "*Also my elder daughter fell through the gaps between the bamboo bridges… I was cutting fishes and my daughter was standing near the door. Then she fell in through the gaps between the bamboo bridges. She went under the water…*" (PB1); • "[from Macha] *I fell down. It collapsed many times. But I got up again...Accidentally drank*

Aspect of life	Impacts	Excerpts
		some flood water but after that I again got up" (PB6); • "*The bamboo bridges broke while we were walking on it…*" (PB7); • "*Many people died… A girl died here… she rolled off the macha and fell in the water… One of my nephews was sleeping and he got bitten by a snake and he died… He was on a macha…There were a lot of snakes at that time…*"(PB10).
Pests	• Snakes; • Insects, centipedes & ants; • Red ants in beds; • Mosquitoes.	• "*There were snakes outside of our house… Snakes used to come in our house. As there was water everywhere* [in 1998]" (PB2); • "*Then there were snakes, everywhere...When the water level was raised we had to deal with insects, centipedes, ants…*" (PB5); • "*We couldn't sleep because of red ants…*" (PB5); • *"…snakes can come in the room… many other scary things…*" (PB9); • "*We have mosquito problems in Dhaka… we don't even have a mosquito nets here… We can't even sleep properly…*" (PB10).

Macha & Bridges

Platforms like the bamboo *machas* and bridges (Figure 5.3), are constructed as coping strategies to facilitate storage of belongings, places for the family to live, and means by which to travel safely and stay dry in times of flood events. However, these structures according to informants' carry with them their own degree of risk and impact. In terms of *macha* and bridges, the biggest danger occurs in slipping or falling off them. Several informants recounted having their children slip off these structures, and having to dive into the water to get them out before they drowned (Table C.9).

Figure C.14 shows photographs (taken during the 2004 floods in Badda by representatives of Food For the Hungry) of *shako*, the bamboo bridges people in Bangladesh make to cross the water so as not to get wet. Design of *shako's* can vary but usually they involve having to walk over a single piece of raised bamboo sometimes made with guide 'rails' and sometimes with not (Figure C.14). As can be seen making use of *shako* carries a high risk of slipping and falling into the water below (Figure C.14). This risk results in impacts on informants, not just because they may hurt themselves from falling, or get sick from being in the contaminated water, but also because many can not swim and falling in carries the risk of drowning - "*I did feel scared at that time. I couldn't swim, I was very scared. What if I fall down?*"(PB5).

(Photographs used with permission from Food For the Hungry)

Figure C.14 "This is the picture [s] of a Shako. They have two bamboos on two sides. If someone gets their footing wrong or slips, they would fall right in the water." (PB7).

Pests

A common topic brought up when talking about the difficulties informants' experience during floods, is the pests (Table C.9). The most common pest discussed were snakes that come into the houses with the floodwaters. Snakes are more than just an annoyance, their potential to cause serious harm or even death, makes them something informants fear - "*When the water was this high I had to raise things to live here. There is the fear of snakes when it floods* " (PB9); "*The scariest things are the snakes. Snakes are worse than the food crisis…*" (PB10). Getting medical attention for a snake bite during a flood is difficult as the injured person can not easily, and swiftly, be taken to get medical help during a flood event, as one informant described in relation to the death of her nephew from a bite - "*One of my nephews was sleeping and he got bitten*

by a snake and he died. He was on a macha… There were a lot of snakes at that time… Water is everywhere, where will we go? We couldn't take him to a doctor." (PB10). Snakes, therefore, pose a physical threat to informants and their families (Table C.9). If the key income earners are bitten and/or killed this can have tangible impacts on the household, as the remaining members will have a reduced income and battle financially (Table C.10), which has the added impact of increasing their vulnerability to impacts from any future flood events, or other anthropological and natural hazards that may occur subsequently (e.g. riots, war, theft, debt collectors, drought, etc.).

Other pests mentioned by informants were ants, mosquitoes and other insects (Table C.9). The most significant impact is that informants can't sleep, which leads to other impacts on health, well-being and peace between family members (Table C.12a). These pests may cause other impacts such as illness, eat stored food, cause general discomfort and inconvenience, however, informants did not bring up these other impacts during interviews.

C.5.3 Impacts to financial resource

Flooding events impact the informants financially, principally because they have so little to start with. In terms of financial impacts, informants discussed two sub-categories:

3. The inability to work or continue income-generating activities during a flood, and
4. The lack of money in general.

Table C.10 presents these two sub-categories, together with supporting excerpts from informants.

Table C.10 The impacts to financial resources as a result of the flooding, as described by informants.

Aspect of life	Impacts	Excerpts
Work	• Husband can't work (difficult to drive, or cant get to work); • Can't sell sarees & other produce; • Takes longer to get things done.	• "*No, I had to miss work for a few days…No, I didn't do anything else… what can I do in water…*" (PB5's Husband); • "*My husband won't be able to drive…*" (PB9); • "*My husband didn't have any work at that time… we were provided flat rice and sugar lumps at our house… we ate those…[*1988]" (PB10); • "*Roads are under water at that time. We cannot sell sarees because there are no buyers there. They say we cannot work how can we buy your clothes?*" (PB1); • "*We have walk through water everywhere. It takes more time to get something done. Something that took an hour now takes 1.5/2 hours to finish…*" (PB6).
Money	• Have to borrow money: • Fall into debt; • Reduced to no	• "*We had to borrow money from people, because we didn't have work. We had difficulty with food* [2004]" (PB8); • "*Yes, we fall in debt for about 3 months every year,*

Aspect of life	Impacts	Excerpts
	income; • Unable to buy food; • Forced to sell land or other property; • Fewer people available to borrow from.	*because we cannot work. And when it floods price of the products rises*." (PB1); • "*In 1998 my father wasn't earning any money for his household. So our house was going through a lot of problems. We had no food in our house*." (PB2); • "*Our examination was going to be held during flood time. So my mother sold 2 acres of our property. We got about 60000 taka and using that money we could complete our HSC exam and have food*.[1998]" (PB2); • "*Yes… we do* [suffer financially*]…It becomes difficult… At that time eating food becomes just as difficult as working…It becomes difficult for the kids to go to school when it floods…The kids suffer a lot… They can't go to school sometimes… If we can't work they will suffer too…*" (PB9); • "*People would lend 500/200 Taka in normal times… But during floods no one would lend money…*" (PB10).

In terms of work, informants talked about the financial difficulties that result from their husbands, or themselves not being able to generate an income [work] the same way they manage when its dry. Most informants' husbands were drivers, who work in the more affluent and diplomatic areas (e.g. Gulshan and Banani). A few informants suggested that their husbands simply didn't come home during floods if they could still work in other areas. Others (including the husbands, if present during interview) said that during bad floods, it wasn't possible to continue working and this meant that there was no income coming into the household during these events (Table C.10). Those informants, who sewed sarees or tailored clothes to bring in additional income into the household, described how they were limited in how they could continue with these actions during a flood (Table C.10). Another point raised was that during floods, all daily tasks take longer to achieve, as walking through water extends travel time, this impacts on their ability to achieve their normal income generating activities (Table C.10).

Jabeen et al. (2010) found that members of the urban-poor community living in the Korail informal settlement in Dhaka, stored up saleable items like firewood, food, medicines or anything of value that they could sell during a flood to replace any income lost from not being able to carry out 'normal' work activities. Although asked if this was the case in this study, informants never mentioned any alternative strategies they have for earning during a flood. It may be that the informants interviewed here lived in more formal urban-poor communities, and this placed them in a slightly better financial or cultural (e.g. castes) position than those living in Korail. One informant put it like this - "*At that time income sources were limited…*[do you have other ways of making any income during a flood?] *No, we did not have any other ways, people who bought boats they had that chance, but not us…We need money to do anything at all: we had no money to begin with…*" (PB7).

Loss of income during floods means that the household has less available money to feed itself. Informants discussed how this means they need to find money through borrowing, or through selling available property (Table C.10). However, borrowing money becomes more difficult during floods, as those they would usually borrow from are hard pressed during floods to be able to spare the capital (Table C.10). On the flip side, borrowing money means that the household falls into debt, which takes time to pay back and increases their vulnerability to future events (Table C.10).

C.5.4 Impacts to travel

Table C.11 lists difficulties and impacts informants reported concerning travelling during floods. Two main travel sub-categories were talked about by informants:

3. Impacts due to the flooded roads themselves, and
4. The impacts resulting from having to utilise boats to get around.

Table C.11 The impacts relating to disruptions in travel or need for alternative forms of travel (i.e. boats) because of flooding, as described by informants.

Aspect of life	Impacts	Excerpts
Roads	• Have to walk through dirty water; • Get stuck or slip in the mud; • Cars fall into water; • Rickshaws still try to pull; • Difficult to move about: • Need a boat.	• "*Roads are under water at that time. We cannot sell sarees because there are no buyers there*." (PB1); • "*The flood water in Dhaka city isn't like other places. It's very dirty and if it touches your skin you would get skin diseases, boils etc. It was a problem even getting down in the water*." (PB8); • "*Now we dispose all the rubbish in one place. But during the floods people just disposed the rubbish in the water. It was not very pleasant to walk through the mud…*" (PB6); • *"… cars fall in the water…*"(PB5); • "*Roads become worse than this* [photograph]. *But people still drives rickshaws through the water*." (PB6); • "*The roads were flooded; there was water everywhere in the locality, till that mosque. We had boats moving about everywhere*." (PB7).
Roads: Holes in the road	• Can't see holes in the road.	• "*I also told them* [her children] *that don't walk in the water. Because the roads can have holes and you won't be able to see that through the water. Those holes can have broken glasses in them. If you step into those holes we might have to amputate your legs, or you might even die*." (PB1); • "*I don't get out much. But if I do then my biggest concern is about my children. What if they fall in a ditch? What will happen if they do? I worry about those things…*" (PB5).
Boats	• Cost money to hire; • Not always available; • Can sink or capsize;	• "[do u use a boat] *Yes...but no one wants to buy sarees at that time anyway, because they struggle to buy food at that time. Who will buy a saree..and whatever profit we make we have to use that to pay*

Aspect of life	Impacts	Excerpts
	• Boats enable thieves to steel belongings.	*the hired boat…*" (PB1); • "*We don't have boats in Dhaka always… in the village we have boats available all the time. So when someone is sick we don't face that much difficulty to take them to a doctor*." (PB10); • "*The bamboo bridges broke while we were walking on it… boats got capsized…*" (PB7); • "*If the water reaches them* [belongings] *they get spoiled, some break and some are looted by people who loots houses on boats…*" (PB1).

Figure 5.4 shows some photos (taken during the 2004 floods in Badda by representatives of Food For the Hungry) of the flooded streets; on the left are photos illustrating the use of boats, and on the right people having to walk waist deep in dirty flood water to get where they are going.

Informants described flooded roads as being a source of a number of problems (Table C.11). The most concerning one is that a flooded road necessitates having to walk through the contaminated flood waters, which is hazardous because of the illnesses contracted from being in the dirty water (Figure 5.4, Table C.11). The high turbidity of the water does not allow for the surface below to be seen, and thus may hide ditches, drains, potholes and any other uneven surface or obstacle on the roads (Table C.11). Figure C.15 shows photographs taken during the 2012 field trip to Dhaka of the state of the roads during the dry season, these holes, ditches and uneven surfaces become submerged during flood events.

Many informants described how they would carry their children to school during floods to protect them from having to walk in the water or along the roads (Table C.13). As discussed above, flooded roads also restrict informants' ability to go out (Table C.11). Those informants who sell sarees on the streets commented on how the flooded streets stops people from coming out and they have fewer costumers (Table C.10). Husbands of informants who drove for a living said, or were described by informants as being reduced in their ability to work because of flooded streets (Table C.10).

(Source S. Birkholz personal observations)

Figure C.15 Images of roads and streets amongst the [urban poor] residential areas of Badda; bottom right is of an open ditch covered with bamboo bridges to enable passage over; bottom left shows examples of uneven surfaces; top right shows open manhole covers in Badda; top left is of an open drain in the Banani Area of Dhaka.

During the interview, when given photos of flooding in Dhaka and asked to comment, informants pointed out that the water impacted on cars and rickshaws - "*There is the driver. The car stopped working. Because of the water* [photographs]" (PB8); "*Things get spoiled, cars cannot be driven, you see. Like this* [photographs], *if the water is like that you cannot drive a car…*" (PB9). One informant commented on how despite high water, rickshaw pullers will still continue to try to work (Table C.11). Alternatively, another informant described how hard it was for her husband who was a rickshaw puller - "*It was very hard for him* [her husband] *to pull the rickshaw as there was water everywhere…*" (PB7). Figure C.16 (taken during the 2004 floods in Badda by representatives of Food For the Hungry) shows a number of rickshaws that have been raised up on bamboo platforms to keep them out of the water, and protected from damage, indicating that there are limits in water depths at which rickshaw pullers can't work.

(Photograph used with permission from Food For the Hungry)

Figure C.16 Rickshaws on bamboo platforms to protect them from being damaged by flood waters.

Flooded streets necessitate the use of boats, and although, these enable dry transport for some and a means by which to get supplies in to stranded households and communities, informants also described how travel by boat carries it own suite of impacts and hazards (Table C.11). First off, to hire a boat costs money, an asset that is not readily available to informants during flood events (Table C.11), and one informant stated that having to hire boats to try to sell her sarees ate into her profit and ultimately contributed to her debt - "[do you use a boat?] *Yes, but no one wants to buy sarees at that time anyway,*

because they struggle to buy food at that time. Who will buy a saree, and whatever profit we make we have to use that to pay the hired boat. We fall in debt at that time." (PB1).

In addition to financial impacts, informants that described the difference between being in Dhaka during a flood and their village, mentioned that in Dhaka boats to get around are not always available, while in their village they are more readily accessible - "*We don't have boats in Dhaka always, in the village we have boats available all the time. So when someone is sick we don't face that much difficulty to take them to a doctor.*" (PB10) (Table C.11). As implied by this informant, not being able to hire a boat can impact on an informant's ability to get or provide help for those who are ill or harmed in some way (Table C.12a). Another informant mentioned how inaccessible boats can also cause important events or appointments to be missed or arrived late for - "*We travelled outside on boats. So we always used hired boat...yeah. One time didn't get a boat in time. We were 40 minutes late for our exam.*" (PB2). Not having access to boats also increases the informant's chances of being stranded and requiring outside aid and assistance - "*We lived on the roof, we got soap and flat rice from people. The foreigners also came to help. People from different places came on trawlers* [Small motorized boat] *and gave us rice and lentils as no one could go to the bazaar. No one had a boat. This happened in 2004 and 1998. In those two floods.*" (PB4).

Other points raised by informants concerning the impacts they experience because of boats, relates to the hazards of riding in them (Table C.11). Informants described how boats would often capsize or sink - "*Sometimes the boats couldn't go, they used to sink. If the wind or current was too strong it would sink*." (PB4); "*We suffered worse than manholes. The bamboo bridges broke while we were walking on it, boats got capsized…*" (PB7). One informant spoke of what she had learnt from her experience with floods, and what she tried to share with others. Within her description she mentioned how she advised those who couldn't swim not to get on boats - "*…I help the new people; tell the people who can't swim not to get on the boats…*" (PB5). This advice most likely relates to the probability of boats capsizing and people not being able to know what kind of water depth this might occur at. At least if they walked they can discern the depth and not attempt to go where swimming might be required. This was iterated by another informant in regards to why she is teaching her son to swim - "*Now I'm trying to make him* [her son] *learn how to swim. Because I know if my son learn how to swim he won't be scared about floods, and when he travels by a boat or a launch* [river boats] *he won't have any problems…yes… I try now. When I go to my village home I put him in the pond so that he may learn how to swim.*" (PB2).

The last point about boats wasn't so much a personal hazard to the informants themselves, but involved descriptions of how thieves utilize boats to steal their belongings during floods - "*If the water reaches them* [belongings] *they get spoiled, some break and some are looted by people who loots houses on boats…*" (PB1); "*All of our belongings were here. If we left them, during the time of flood if someone raided our house and took everything away on boat…*"

(PB5) (Table C.11). Boats, therefore, enable thieves to take the belongings in homes where people have had to flee or have moved away for safety (Tables C.8 & C.14).

C.5.5 Impacts to health & well-being

An important range of impacts informants experience during floods, are those relating to their (or their family's) health and well-being. These impacts influence most other aspects of life (e.g. context, finances, travel, family etc.) and directly affect informants' ability to withstand and rebuild. In exploring the impacts described by informants during their interviews, two groups of sub-categories were identified as relating to health and well-being.

3. The first (Group 1) focused on the aspects of informants' health and well-being directly affected by floods or during floods (e.g. psychological aspects, illness etc.) (Table C.12a);
4. The second (Group 2) looked at indirect impacts on informants' health and well-being, those impacts resulting from impacts to other areas of informants' lives because of flooding (food, water, sanitation and relief) (Table C.12b).

Group 1 - Health & Wellbeing 'directly'

The use of the term 'health' here denotes the physical wellness of the people, and includes aspects such as illness, injury, allergies, and death. All physical impacts affecting informants anatomically and/or physiologically. Impacts to health are some of the most concerning to informants. Being sick or injured greatly increases their (or the sick member of their family's) vulnerability to other impacts such as death, inability to get help or medical aid, and ability to fight the general hardships associated with floods. In addition it increases the vulnerability of the family or household as well. Sick individuals are unable to contribute either financially or through physical help (i.e. in building platforms, or fetching water, or cleaning), which increases the load healthy family members must bare. A significant aspect for the informants of this study, was the difficulty of having to watch their children suffer from any form of ill-health brought on as a consequence of a flood - "*There are many problems. We are worried about the children mostly…*"(PB9) (Tables C.12a & C.13).

Table C.12a Impacts on informants' health and well-being - impacts to person directly (e.g. Their own health and well-being).

Aspect of life	Impacts	Excerpts
Health	• Increase in sickness & illness: o Diarrhea, dysentery, jaundice, typhoid; • Injury (fall, slip); • Allergies; • Fungal attacks; • Boils on feet & body;	• "*We have problems… Our belongings gets spoiled, the children gets skin diseases, fever, diarrhea and many other things…*" (PB5); • "*We had boils in our feet, we had diarrhea*." (PB6); • "*The children suffer from skin disease because of the contaminated water… We catch colds and fevers, also many other diseases…*" (PB5); • "*We get many diseases… skin diseases, we get rashes and allergies in our hands and feet, we suffer from diarrhea… children suffer from*

Aspect of life	Impacts	Excerpts
	• Infections; • Drowning; • Unable to sleep; • Minimal access to medical help.	*fever…*" (PB7); • "*People get sick more often in different houses. Diseases like diarrhea are there all the time. When we get wet in the water we get an after effect from it. We get diseases later*." (PB8); • " *they* [family members] *get diarrhea…They get dysentery, jaundice and typhoid at that time…*" (PB9); • "*When we got down in the water we got hurt many times. We had fungal attack on our feet, our feet went white* [2004]." (PB8); • "*The flood water in Dhaka city isn't like other places. It's very dirty and if it touches your skin you would get skin diseases, boils etc."* (PB8); • "*My daughter used to go to work walking though that water which was at her chest level. She had boils all over her body…*" (PB10); • "*We had mud all over our feet. Our feet were filled with boils. We couldn't sleep at nights because of the pain…*" (PB1); • "*I already told you that my daughter fell in the water, my mother also fell. I myself don't know how to swim. I almost drowned here once. Someone pulled me out of the water*." (PB5); • "*It was about the table's height in my room. It's even higher outside. People get drowned in the water*." (PB9); • "*So we suffer a lot. We have snakes in the villages. The children can't sleep at night, we sit with our children and not sleep, because we are so frightened*." (PB10); • "*Many people died, A girl died here, she rolled off the macha and fell in the water. One of my nephews was sleeping and he got bitten by a snake and he died. He was on a macha. There were a lot of snakes at that time. Water is everywhere, where will we go? We couldn't take him to a doctor…*" (PB10).
Well-being	• Anxious for family & children; • Difficulty sleeping; • Suffering - water in house; • Family cramped together - hot; • Get wet, have to swim/walk in dirty water; • Evidence of death in the community around - illness & floating bodies; • Pregnant at time; • Responsibilities of daily life still	• "*There are many problems. We are worried about the children mostly…*"(PB9); • "*The children can't sleep at night, we sit with our children and not sleep, because we are so frightened*." (PB10); • "*Our feet were filled with boils. We couldn't sleep at nights because of the pain… the kids…*" (PB1); • *"…we suffered a lot before. When rainy season came before water came in our house…*" (PB7); • "*If the water level comes in our house, then we suffer even more. We have to raise everything, make machas. We have to cramp ourselves in a small area so it becomes hot. We don't have peace in the house. We can't even go out… It's really difficult to live…*" (PB5); • "*We can slip any time. Water comes inside the class rooms as everyone is wet*." (PB2); • "*We couldn't even change clothes frequently, we*

Aspect of life	Impacts	Excerpts
	present; • Fear, frightened; • Loss of tempers; • Watching family & loved ones have to deal with extreme hardship; • Inability to help.	*had to wear the wet clothes…* " (PB7); • "*My daughter used to go to work walking through that water which was at her chest level. She had boils all over her body…*" (PB10); • *"…dead people were floating in the water… in 1988 we also struggled a lot*." (PB10); • "*At that time I was 8 months pregnant, I had to be confined in one room and I couldn't go anywhere. I was in one room and couldn't go anywhere. I struggled a lot.* [1998]"(PB7); • "*In rainy season the routine is still the same. The only difference is it becomes a bit more difficult to commute during rainy season*." (PB4); • "*The floods are more frightening, the rains don't do much damage...Floods are more frightening* [then earthquakes]" (PB4); • "*We have problems with our temper. If we can't socialise with one another or go somewhere we want to go it's natural that we would be short tempered*." (PB4); • "*Also my elder daughter fell through the gaps between the bamboo bridges… She was almost drowning and drinking the water*." (PB1); • "*If someone is facing a problem we can't go to help them out. If we go we might be stuck there and not be able to come back."* (PB4).

As is evident from the list of impacts, and supporting excerpts in Table C.12a, informants have a wide spectrum of battles to face from health impacting agents around when it floods. The biggest of these is the contaminated floodwater informants have to move around in (and often live in) (Table C.12a). Having to walk in the dirty floodwater was described, by informants, as resulting in skin diseases (rashes, allergies, boils, fungal infections) - "*We get many diseases… skin diseases, we get rashes and allergies in our hands and feet, we suffer from diarrhoea, children suffer from fever…*" (PB7); "*When we got down in the water we got hurt many times. We had fungal attack on our feet, our feet went white* [2004]." (PB8); "*My daughter used to go to work walking though that water which was at her chest level. She had boils all over her body…*" (PB10) (Table C.12a). Being wet results in other illnesses such as colds and fever (Table C.12a). Other pathogens become more prevalent as the water sits e.g. Dysentery, Jaundice and Typhoid; and incidents of diarrhoea increase with exposure to the floodwater (Table C.12a).

In addition to illness prevalence, the likelihood of injury also increases - "*We can slip any time. Water comes inside the class rooms as everyone is wet*." (PB2). As discussed previously having to walk along platforms and bamboo bridges carries the risk of slipping and falling (Table C.9). On a similar vein having to travel by boat carries the risk of falling off, or it capsizing or sinking (Table C.11). Water in homes bring pests, and informants recounted on how the floodwaters increased the threat of snakes and injury related to a bite from them (Table C.9).

Several informants mentioned they or their children could not swim, not having this skill places them at risk of drowning should they fall into a deep area where they can't stand - "*I already told you that my daughter fell in the water. My mother also fell. I myself don't know how to swim. I almost drowned here once. Someone pulled me out of the water.*" (PB5). Death from falling, drowning, and illness becomes more prevalent during floods - "*In 98 when it flooded the whole field was under water. Crops were destroyed, we suffered a lot -Food problems, communication problems, problems with medicines, and dead people were floating in the water. People suffered from Diarrhea*." (PB10). Death becomes more likely as people can't get the sick or injured medical help due to the floodwaters (Table C.12a).

In terms of 'well-being' the term is here used to describe more abstract aspects of people's make up. Aspects such a psychological issues e.g. stress, fear, cognition and emotions (Table C.12a). These aspects are linked to individual's perceptions of the situation and impacts to themselves and their family, the extent of the impacts, the degree of control related to the impacts, the emotional connection to the impacts and their consequences. Much of what is meant by 'well-being' carries at its core the strength informants reveal in terms of finding the courage to 'fight' and to 'persevere' in the face of harsh events and conditions.

Flooding is a source of fear for informants, whether it's from memories of past events, living in the midst of it, or potential future events, all informants indicated that floods and the events relating to them caused them anxiety and fear. Excerpts presented in Table C.12a help paint a picture of some of the impacts of floods that affect informants' well-being. Fears over the safety and health of their children appear to be a prominent sub-category that emerges from informants' responses[74] - "*I don't get out much. But if I do then my biggest concern is about my children. What if they fall in a ditch? What will happen if they do? I worry about those things*." (PB5); *There are many problems. We are worried about the children mostly, if we can't live here with the children we go to our relatives' house*." (PB9) (Table C.13). Some of the informants discussed how these fears kept them up at night, and many informants described how they tried to ensure that they carried their children to school so that they would not get wet - "*We carried the children on our shoulders to their school. We got wet ourselves but we didn't let our children get wet*." (PB6).

Other aspects that bring anxiety and stress include: illness due to walking in the water (e.g. boils on skin); lack of sleep due to skin irritations (and pests Table C.9); discomfort at being wet most of the time; difficulty in undertaking daily tasks and routines; inability to socialise; short tempers; lack of peace in the home (Table C.12a). Families often live cramped on the bamboo or wooden platforms they make to safeguard them and their belongings. These hot-cramped conditions (up to six people on a platform in one small room, in Dhaka's hot & humid climate) make it difficult for household members to not

[74] This is not surprising given the informants are all mothers.

start getting irritated and/or annoyed with other family members, and tempers can irrupt. Although no informant spoke directly of domestic violence they had or hadn't experienced, a number of other studies have highlighted that during floods domestic violence towards women can become more prevalent (Rashid, 2000). Issue such as having to ask for money for the bazaar when there isn't any is reported by Rashid (2000) as leading to a wife or daughter being beaten.

Group 2 - Health & Wellbeing 'indirectly'

Table C.12b lists the different aspects of life that when impacted because of flooding indirectly impact on informants' health and well-being. These involve: difficulties related to getting clean drinking water; difficulties in feeding themselves or family due to access to food issues; impacts to sanitation and hygiene facilities; and reduced ability to help or get help (Table C.12b).

"*We have difficulty getting food and water*." (PB6). During floods the availability and accessibility of food and clean water decrease. The difficulties encountered in getting these important life aspects are connected to impacts on other aspects such as: utilities (i.e. water supply & electricity for cooking) (Table C.8); being able to work, and available monies in the household (Table C.10); ability to travel and get out of the house to get clean water and food (Table C.11); in some cases health issues can prevent informants from being able to go out and get clean water and food (Table C.12a); or having access to help and relief (Table C.12b & C.14).

In not having a constant and reliable supply or availability of food and water, informants and their households are placed under stress, which increases as hunger and thirst build up. This stress can have long-term psychological consequences. Prevalence of hunger and thirst can lead to weakness and reduced capacity to resist illness and other health impacts. One informant spoke of burning herself on the mud stoves (Figure C.19a&b) they build to replace their electric or gas stoves - "*We suffered like this… We were in this situation…*[photographs]*...We had to be like this for many days, without food. I burnt my hand trying to cook in one of those stoves. I still have the scars…*" (PB10). Need to afford food means that informants are forced to borrow money that leads to loans and long-term financial debts (Table C.12b & C.10) - "*Yes, we fall in debt for about 3 months every year, because we cannot work. And when it floods price of the products rises*." (PB1). One informant implied that during periods of hunger, condition of available food becomes less important - "*Whatever I could get I ate. I was more worried about whether I would be alive or not…*" (PB7). Having to eat poor or spoiled food can lead to additional health impacts such as illness, and even death.

Table C.12b Impacts on informants' health and well-being - impacts to important variables (e.g. Food, water, relief) that influence informant's health and well-being.

Aspect of life	Impacts	Excerpts
Clean water	• Need to fetch for a far; • Thirsty/dehydration; • Spread of disease & illness.	See Table C.8
Food	• Reduced access & availability: o Can't get to market; o Have to go hungry; • Reduced ability to cook & prepare food: o Stove goes under water; o Lack of firewood.	• "*We suffered most with food. Sometimes we couldn't even cook for a week*" (PB6); • "*I had to struggle to get the food, but I had to get it for my little children. My husband used to go to get the food by boat. It wasn't possible everyday. Sometimes we didn't eat for a day or two*." (PB7); • "*We had to borrow money from people, because we didn't have work. We had difficulty with food. We cooked once a day and we had that three times.* [2004]" (PB8); • *"…At that time [during a flood] eating food becomes just as difficult as working…*" (PB9); • "*During this time the roads stay wet or water logged, we can't go to the market for groceries. So at that time we stay home and have mashed potatoes*." (PB3); • "*We can't go to shops. We can't go to the bazaar. We suffer a lot*." (PB5); • "*We found it difficult to cook, our stove went under water* [2004]" (PB8); • "*We didn't have roof in out house, everything was under water. We starved - we couldn't make bread with flour, because it won't be enough for all of us. So we used to make a thick gravy with flour and then had it. The stove was under water. We didn't have any fire wood. It was very difficult to cook.* [1988]" (PB10).
Sanitation, waste & ablution	• Toilets under water; • Sewage floating on the top of water; • Rubbish disposed of into the water; • Table C.8.	• *"…the children find it problematic to go the bathroom since the sewage floats on water…*" (PB3); • "*Bathrooms get drowned…*" (PB9); • "*Now we dispose all the rubbish in one place. But during the floods people just disposed the rubbish in the water*." (PB6); • Table C.8.
Help & relief	• Being able to be of help; • Given dried food (rice & lentils) & soap; • Not enough; • People do not readily give help; • Little help from outside - must help	• "*There was about 371 houses in the slum. I helped them get rice, lentils and salt from those NGOs*." (PB1); • "*No government or NGOs have helped about this situation. I cannot see. We help the people in this area. So does Food for the Hungry*." (PB2); • "*The gas stove goes under water you cannot boil the rice, sometimes people bring cooked rice with lentils using boats, but it's so little in*

Aspect of life	Impacts	Excerpts
	selves; • Relief stolen by authorities & officials.	*quantity, it's not enough for us and the children…*" (PB10); • "*We lived on the roof, we got soap and flat rice from people. The foreigners also came to help. People from different places came on trawlers [Small motorised boat] and gave us rice and lentils as no one could go to the bazaar. No one had a boat. This happened in 2004 and 1998. In those two floods*." (PB4); • "*We didn't have any outside help. We had to work ourselves. The relief sent by government were taken by the chairmans and other government officers. They gave us something twice, like 5 KGs of rice.*" (PB5); • "*At that time if someone does a little, it feels like that they have done a lot. When someone doesn't help at all, we feel bad that we are in such trouble and no one is bothering to help us.*" (PB7). • "*When the flood is not that high, we have some ways to survive. We can tell someone that we are dying here, so they help us, But if it floods everywhere then we don't get any help. Suppose if you had a high raised building, then you can see people suffering and you can offer them help. But if everyone is facing problems, then they are busy with themselves, and don't have time for others…*" (PB7); • "*the distributing parties steal all the stuff before the things come to us; we get one KG of flat rice and 250g of sugar lumps every month, for a family of 7 it's not enough.*" (PB10).

Many of the issues associated with reduced sanitation and waste systems are highlighted in reference to Table C.8. Unhygienic conditions have direct impacts on both informants' health and well-being. Frequent exposure to human waste floating or breaking down in the water, as well as household waste disposed of in the water significantly increases chances of illness and disease. Being aware of the exposure, and living with the visual and olfactory evidence has an impact on the psychological well-being of informants and their families - "*There is no longer the opportunity to drink water from tube well, the children find it problematic to go the bathroom since the sewage floats on water, it's not possible to walk on the roads, the children eat their food with disgust, diseases occur…*" (PB3).

The last aspect identified as influencing health and well-being relates to being able to get help (or relief) during difficult times, or being able to be of help (Table C.12b). In regards to being able to be of help, helping is not an impact (although it does diminish their own supplies and time), however, conversation with informants suggests that being able to help greatly empowered informants see Section 5.5 and Table 5.10. Conversely then it is assumable that not being able to help others has a disempowering effect on people's well-being.

Alternatively, needing help or to ask for help places informants in a position of shame and lowered esteem - "*At that time if someone does a little, it feels like that they have done a lot. When someone doesn't help at all, we feel bad that we are in such trouble and no one is bothering to help us…*" (PB7). However, help is not always available as the same informant put it - "*When the flood is not that high, we have some ways to survive. We can tell someone that we are dying here, so they help us. But if it floods everywhere then we don't get any help. Suppose if you had a high raised building, then you can see people suffering and you can offer them help. But if everyone is facing problems, then they are busy with themselves, and don't have time for others…*" (PB7) (Table C.12b). During large events everyone is affected, and the sources of local help are reduced. Another issue encountered was corruption amongst the distributing agents, some informants mentioned how these people took the aid available for them - "*We didn't have any outside help. We had to work ourselves. The relief sent by government were taken by the chairmans and other government officers… They gave us something twice…*" (PB5); "*the distributing parties steal all the stuff before the things come to us…"* (PB10) (Table C.12b).

In not having access to help and relief informants are left to survive on minimal amounts of food and rations, increasing the chances of hunger and illness. These situations lead to long-term hardship and suffering that result in short and long-term psychological trauma and stress (Table C.12b).

C.5.6 Impacts to family & community (social context)

Table C.13 lists impacts to informants as it relates to their family and community (social context). For the most part informants didn't share much on extended family tending instead to focus in on immediate family i.e. their children and husband. However, family by and large represents an important form of social capital and support - "*My family is there, my husband said, family is there, if we live we live together, if we die we die together…*" (PB10).

Family

As previously described, informants all indicated that their children are a point of great concern during floods - "*I don't get out much. But if I do then my biggest concern is about my children. What if they fall in a ditch? What will happen if they do? I worry about those things…*" (PB5). The health and safety of their children was discussed above their own, and it was observed, by the author, that it was a point of great significance that she be aware of the lengths they went to protect their children. Box C.5 lists informants' descriptions of how they protect their children.

Box C.5 Informants' descriptions of ways they protect their children, and the importance of saving the children during floods.

- "*I did that [tie children with a string so they couldn't fall into the water], didn't matter if they cried. It was done so that they may not fall in the water*." (PB1);
- "*We carried the children on our shoulders to their school… We got wet ourselves but we didn't let our children get wet*." (PB6);
- "*We have to raise the belongings, save the children*" (PB8);
- "*There are many problems. We are worried about the children mostly. If we can't live here with the children we go to our relatives' house*." (PB9);
- "*No. I taught my children, stay away from water, don't drink the water, don't play in the water*." (PB10).

Impacts informants experience in relation to their husbands, occur as a result of him not being able to work and bringing in an income. This impacts informants in a number of ways as discussed in connection with Table C.10.

Table C.13 The impacts to family because of flooding, as described by informants.

Aspect of life	Impacts	Excerpts

Children	• School:
	  ○ Carry Children to school so they do not get wet;
	  ○ Water in class rooms - muddy & slippery;
	  ○ Books get wet;
	  ○ Closed.
	• Get sick/wet;
	• Fall through gaps in the bridges;
	• Can't get to school, can't do exams;
	• Can't get out of the house to play;
	• Increase in hazards that could hurt or make them sick;
	• Can't always be watched (to ensure they do not get hurt);
	• Get/go hungry;
	• Drown;
	• Cause worry & anxiousness;
	• Suffer;
	• Need help to handle.
		• "*When there was flood the last time my elder daughter was in Alltunnesa School. I took her on my laps and carried her across the roads. I got wet. When she came back home I had to carry her again*." (PB1);
		• "*We carried the children on our shoulders to their school…We got wet ourselves but we didn't let our children get wet*." (PB6);
		• "*Yes, it is. We can slip any time. Water comes inside the class rooms as everyone is wet. The books also get wet. So it's very difficult to continue the classes. And We cannot maintain our class easily. Sometimes we end the school early and send everyone home*." (PB2);
		• "*During flood time my children have their final exams; they find it difficult to go to school at that time. They can't go sometimes so they get less score. In some school they cut marks for missing the school even one day…*" (PB4);
		• *"…the children gets skin diseases, fever, diarrhea and many other things…*"(PB5);
		• "*The children suffer from skin disease because of the contaminated water…"* (PB5);
		• "*I also told them* [her children] *that don't walk in the water. Because the roads can have holes and you won't be able to see that through the water. Those holes can have broken glasses in them… If you step into those holes we might have to amputate your legs… or you might even die…*" (PB1);
		• "*This daughter of mine can swim...I saved her twice…She fell in the water once and I*

Aspect of life	Impacts	Excerpts
		had to dive underwater to get her…" (PB5); • *"Also my elder daughter fell through the gaps between the bamboo bridges… She was almost drowning and drinking the water. Then I jumped in and rescued her.*" (PB1); • "*It is very difficult for me to watch over my child in this area where water logging occurs... especially the boys are very naughty. They like to jump in the dirty water…*" (PB2); • "*The gas stove goes under water… you cannot boil the rice… sometimes people bring cooked rice with lentils using boats… but it's so little in quantity… it's not enough for us and the children…"* (PB10); • "*I earn some money through work to sustain my family… if it floods I won't be able to go to the market and I won't be able to feed my children…"* (PB10); • *"…the children find it problematic to go the bathroom since the sewage floats on water, it's not possible to walk on the roads, the children eat their food with disgust, diseases occur, it becomes difficult to cook, it's becomes difficult to feed the children on time…"* (PB3); • "*This daughter of mine can swim...I saved her twice…She fell in the water once and I had to dive underwater to get her…"* (PB5); • "*We face a lot of difficulties during the monsoons. There is water everywhere. We leave our children home. We are always tense…"* (PB1); • "*My baby was really little… We couldn't get out of our house… I had difficulty with my son… in 2007 he was… 6 months…*"(PB2); • "*I worry that he [her son] might get wet in the rain and fall sick*" (PB2); • "*My daughter was so little so I was afraid that she might fall and get hurt* [1998]" (PB5); • "*There are many problems… We are worried about the children mostly…If we can't live here with the children we go to our relatives' house…*" (PB9); • "*The kids suffer a lot…"* (PB9); • "*I can't handle my children alone… There [in the villages] people can help me take care of my children… No one is here to help me…"* (PB10).
Husband	Can't work; Has to go away to find work; Takes children to shelter.	"*No, there was any work for him to do. Everything shuts down where the water comes…*" (PB8).

Aspect of life	Impacts	Excerpts
Community	• Families leave • Commuting & communication routes breakdown.	• "*But I struggled a lot when I was small, because we had nowhere to go. Every house was flooded. A lot of families left. We lived with many hardship* [1988]" (PB9); • "*We face problems in commuting. If someone is facing a problem we can't go to help them out. If we go we might be stuck there and not be able to come back. The children face problems while going to school. We have problems with our temper. If we can't socialise with one another or go somewhere we want to go it's natural that we would be short tempered*." (PB4).

Community

In describing what people like about Badda and why they like living in Badda, the dominant reason given by informants was community and the close relationships between them and their communities. Box C.6 lists some supporting comments regarding informants' feelings of connection with their community. A significant social impact of flooding on the informants is the scattering of members of their various communities, 'suffering' of their kin and friendship networks, and removal of themselves from their community contexts either because they go to family in villages, or because they have had to evacuate and leave their home and area.

Box C.6 Informants' responses regarding their sense of community and feelings of connection with it and within it.

- "*Of course* [feel connected to the community]. *I love all the people in this community*." (PB2);
- "*Everyone lives here together in harmony*, *everyone is nice*." (PB4);
- *"…everyone here is like my family. We have our actual family members around this area too. Everyone knows me, they know my name. The new tenants that come I get familiar with them gradually. But there are many people who have been here for a really long time. I know all of them*." (PB5);
- "*Yes, very good relationships...we are like families…*" (PB6);
- "*Why wouldn't I not like this place? I'm living here, I know all the people. When I am in danger I get help from them. When someone else needs help we do the same for them. So isn't it better for us if we knew each other? I think everyone is very close to me… when you think otherwise they won't be close to you. I feel like everyone is my kin*." (PB7);
- "*If you live here in one place for a long time everyone becomes close to you. My neighbours have lived here for more than 10-15 years. Everyone is like my relative. My actual relatives live far away so I think everyone in my community as my relatives. That's why I live here and I feel safe*." (PB8);
- *"…We help each other when needed, I always get help. They are like family*." (PB9);
- "*We know everyone and everything. Everything became close to us… That's why we love it here*." (PB10).

C.5.7 Impacts to evacuation & recovery

The last set of impacts relate to having to evacuate during a flood event, and to the difficulties informants mentioned in relation to events post the flood, and during recovery. Table C.14 lists the impacts associated with the categories of

evacuation and recovery, as well as supporting excerpts from informants' interviews.

Table C.14 The impacts to informants as they relate to [possible] evacuation and their recovery from large flood events, as described by informants.

Aspect of life	Impacts	Excerpts

Evacuation	• Conditions at shelters;
	• Need to leave belongings;
	• Need to find somewhere to shelter:
	  ○ Nearby buildings (under construction);
	  ○ Live on the streets;
	• Move to village;
	• Move to relatives houses.
		• "*The worse day was then* [1998], *when we had to leave our house as the water level was just too high. That was the most painful experience.* [lived] *In a school in Rampura. We lived there for a month. There were thousands of people over there, we couldn't cook and eat ourselves, we starved the whole day. They didn't allow us to light the stoves in the morning. They thought it would create a lot of rubbish in the school premises. They came to our room at 12am and they noted down the number of people in the family. They gave us a card. They called us by our names and asked how many members we have in our family. When I said 6 they gave us one* container of rice and one container of lentils that had potatoes in them." (PB1);
		• "*If we live in a school we can see 300 people we have never seen before…"* (PB7);
		• "*All of our belongings were here. If we left them, during the time of flood if someone raided our house and took everything away on boat, we won't be able do to anything, and if we left with our belongings no one would take the trouble to provide shelter for us…"* (PB5);
		• "*We took it* [their belongings] *in that 3 story building during 1991 and on the streets during 88. We couldn't take everything. We took whatever we could, the rest we put above the roof on a macha."* (PB6);
		• "*Water got into everyone's house in our area. Where would we go that suddenly? Who will give us shelter? So they were making a few stores in the middle of that area. So we lived in those shops for 2 months. We struggled a lot. We stayed there for 2 months, after the water went down we came back…"* (PB9);
		• "*Yes when we took shelter in the school because our house was flooded and we couldn't live there anymore…In 2004 flood, also during 1988. But I was small then. I was with my parents and went to the school*" (PB9);
		• "*We go through many difficulties at that time. People go take shelter somewhere or go to their village houses. People whose houses are in better condition in the village go there. The come back when the flood ends*." (PB9);
		• "*We struggle a bit in Dhaka. But we can go to higher places in Dhaka. In Dhaka we can get*

Aspect of life	Impacts	Excerpts
		shelter in local schools, people some times leave their houses to provide space for flood victims…" (PB10); • "*The water level was up till here* [neck in the streets and chest in house*]… We kept raising our belongings but we couldn't stay in the house. How much more could it be raised? We couldn't stay in the house, so we locked the house and went to the village. We can buy new furniture but we can't get our children back if something happens to them. So we went to our village in our father-in-law's house*." (PB10).
Recovery	• Takes months; • Duration of standing flood waters; • Results of receding water leaves: o Stench; o Rubbish in houses; o Increased sickness & vulnerability to sickness; • People start returning to their homes.	• "*A long time, 6-7 months, to recover from the flood, to heal the children, there are diseases when the water goes away, diarrhea, jaundice, there is rubbish everywhere, it takes long time for the stench to go away…*"(PB10); • "*There were more problems at that time [after the flood]. When the water level goes down we get a lot of rubbish in our house. When everything dries up there are more germs to deal with. People get sick more often in different houses. Diseases like diarrhea are there all the time. When we get wet in the water we get an after effect from it. We get diseases later*." (PB8); • "*It's more difficult for us when the water level doesn't recede rather than when the water level rises. There are rotting animals such as rats, they have bad odour. Flies everywhere, we had to struggle a lot. We had mud all over our feet. Our feet were filled with boils. We couldn't sleep at nights because of the pain…*" (PB1); • "*The water was there for one month, water level kept rising for a month, then it took a month for the water to recede. Then to clean everything up with detergent and bleaching powder it took about a month…* [in 2004]" (PB9); • "*People go take shelter somewhere or go to their village houses. People whose houses are in better condition in the village go there. The come back when the flood ends*." (PB9); • "*So we lived in those shops for 2 months. We struggled a lot. We stayed there for 2 months, after the water went down we came back*. [1988]" (PB9); • "*We returned home as soon as the flood went down, 3-4 months…*[1988]" (PB6).

As discussed in connection with Table C.8, informants in general would prefer not to have to leave their homes. Choosing instead to live on the roof and stay with their property for as long as is possible. However, in extreme events this is

not an option left to informants, and they have to seek shelter elsewhere. In addition to the mention of schools being made into local shelters, some informants described how they had lived on the streets, or in nearby buildings still under construction - "*We took* it [their belongings] *in that 3 story building during 1991 and on the streets during 88…We couldn't take everything. We took whatever we could, rest we put above the roof on a macha.*" (PB6) (Table C.14). Another informant described having to live in some stores that were being built near to where they were - *So they were making a few stores in the middle of that area. So we lived in those shops for 2 months…" (*PB9). Alternatively those who have family in rural villages, or have access to property out there, will go to these to get away from the flood impacts in Dhaka - "*People go take shelter somewhere or go to their village houses. People whose houses are in better condition in the village go there."* (PB9) (Table C.14).

Having to leave their property carries direct tangible consequences, in that their belongings and homes become more vulnerable to thieves and vandals (Table C.8 & C.14). It also carries a significant amount of psychological trauma as discussed in regards to Table C.8. Social disruptions (Table C.13) are also increased with the departure and scattering of community and family members - "*I was at home. But the children and their father went to Khulna because they were too little and the water here was too dirty…*" (PB8) (Table C.14). Evacuation shelters are crowded which means informants who had had to go to them, found themselves surrounded by many who were not from their communities, and unknown to them - "*That was the most painful experience.* I*n a school in Rampura. We lived there for a month. There were thousands of people over there. We couldn't cook and eat ourselves, we starved the whole day.*" (PB1); "*If we live in a school we can see 300 people we have never seen before…*" (PB7). Not being able to eat properly at the shelters due to the small rations provided can lead to malnutrition and ill-health, and the high concentration of people in one place means the spreads of any contagious diseases occurs more rapidly. Figure C.17 shows some scenes of women and children at an evacuation shelter (taken during the 2004 floods in Badda by representatives of Food For the Hungry).

The difficulties and problems informants experience during floods are not over when the waters begin to recede, in fact one informant said that the time following the floods were often worse than the event itself - "*There were more problems at that time* [after the flood]*. When the water level goes down we get a lot of rubbish in our house…"* (PB8) (Table C.14). As the water recedes, rubbish and mud are left in its place and the prevalence of illness and disease increases (Table C.14). An informant then faces the big task of cleaning and putting their homes back to right, with this task comes inconvenience, discomfort (smells, mess, rubbish) and shame at the state of their property. The process of recovery takes months (years in the case of extreme events), and leaves informants and their families vulnerable to future events and social pressures. Many will have accrued debt during the flood, and/or lost belongings and property all of which takes a financial impact on informants (Table C.10).

(Photographs used with permission from Food For the Hungry)

Figure C.17 Images of people at an evacuation shelter (school) in 2004 floods.

The ability to recover is largely influenced by the degree of impact informants have experienced in all the above categories (physical context aspects, financial, travel, health and well-being and social context aspects) - "*We have problems. Our belongings gets spoiled, the children gets skin diseases, fever, diarrhoea and many other things. To get over all these things it takes about 1 1/2 years. We lose many things under water too…*" (PB5). As well as the characteristics of the event itself, i.e. duration, depth and timing. Figure C.18 presents a map of the impacts informants reported experiencing during floods.

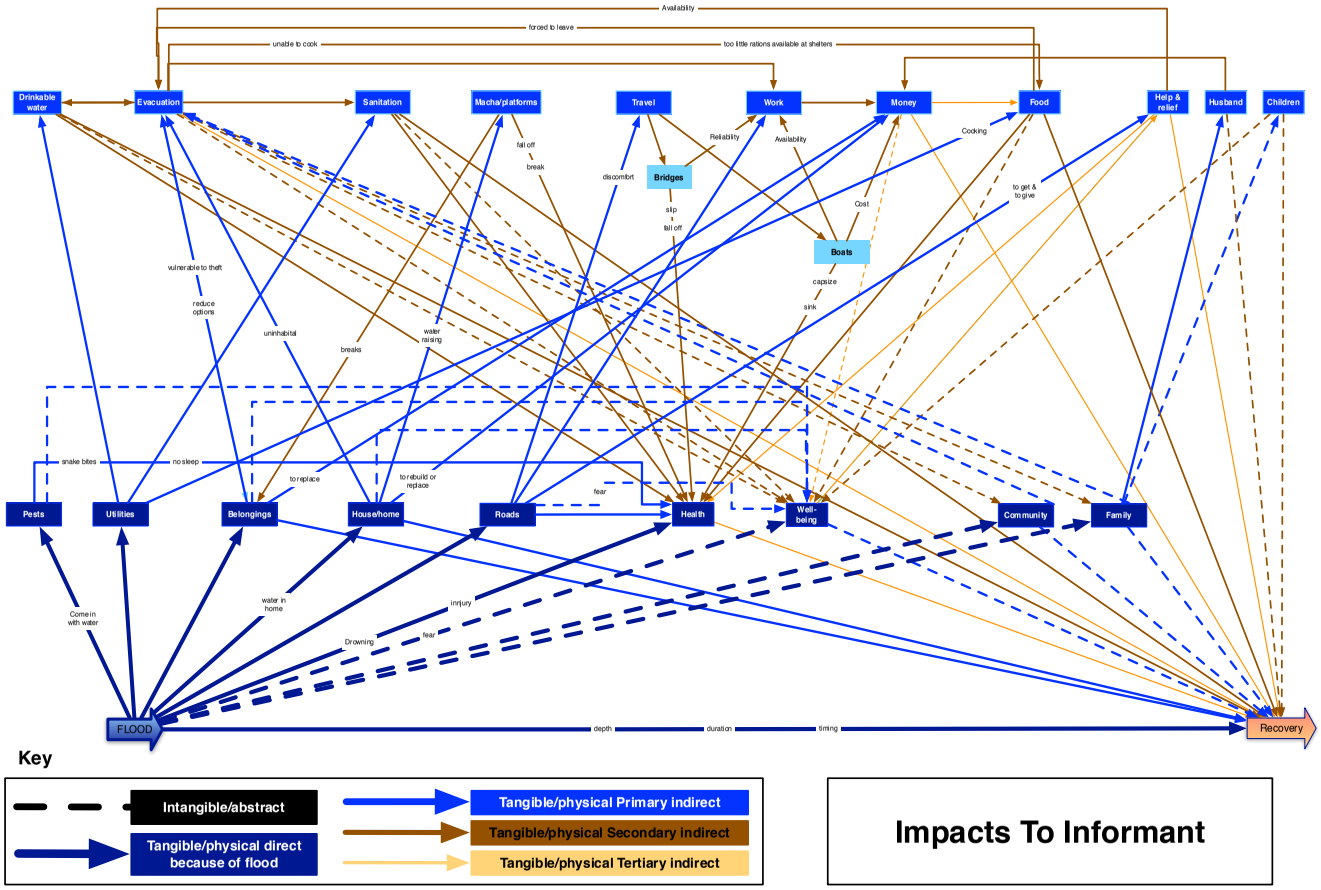


Figure C.18 Map of impacts to informants originating because of floods. Solid lines indicate physical/tangible impacts, dashed lines indicate abstract/intangible impacts. Darker the line more the impact is more directly caused by flooding, the lighter the line, the greater the degree of removal from flooding being the caused i.e. Indirect impacts causes as a consequence of secondary hazards or threats created by the flood.

C.6 Coping responses: actions & strategies for coping with floods

Under this theme the actions and strategies informants discussed in connection with coping with floods is described. Interestingly most of these actions were not given in response to a direct question regarding coping strategies, but instead were included as innate aspects of informants' discussions on their flood experience/s. As discussed in Section 5.5 (informants' coping appraisal), informants have to cope with floods, and their frequent previous experience has engendered a cultural entrenchment of floods in their understanding of their lives. This means that its quite natural on numerous levels to innately talk about how they dealt with a situation during a flood, because that is what they have all had to learn as a society faced with this reoccurring threat, and as being able to cope with a flood is a point of personal and cultural pride and respect. The following section provides informants' responses as they relate to the different aspects of life impacted on by floods (i.e. belonging & property - physical context & secondary hazards, travel, health, livelihood, and family - social context) discussed in Section 5.2 (prior experience).

C.6.1 Physical Context

The physical aspects of life here include belongings and property, loss of electricity and water, as well as the secondary hazard of pests.

Belongings & Property

When you do not have a lot in the beginning, being able to protect what you can during a flood is an important coping ability. From informants' interviews five strategies for protection of belongings were identified. These are:
1. Raising belongings;
2. Moving belongings;
3. Packing belongings;
4. Staying with belongings; and
5. Prioritising the value of belongings.

Table C.15, lists these five strategies and informants' supporting excerpts.

Although, wooden and bamboo platforms (*macha*) were identified in Section 5.2 as a secondary hazard they are constructed as a strategy for keeping belongings and family members safe from flood waters. Raising belongings on bricks and platforms (*macha*) represents the main way in which informants protect their household items and keep their available food safe from being spoiled and damaged by floodwaters. Packing belongings to try to protect them from being spoiled was one of the chief actions informants did in preparation of floods. It is not possible for informants to raise and protectively pack all their belongings, so things are raised relative to their value and/or potential cost of having to be replaced. Electrical goods such as fridges are placed on raised beds, however, furniture like table and chairs are left down (Table C.15), one informant described it as - "…*Only the necessary things we can save…*" (PB9).

A few informants described staying at home, while their children and husband went to safer areas, like the villages, or relatives who had houses in dryer regions (Table C.15). Although none specifically said they remained to watch over their belongings, they did mention how going made their belongings vulnerable to theft so staying enabled there to be someone to watch over their property. Alternatively it may be that where their family is evacuating to does not have enough room for the whole family, and getting the children to safety is a priority.

Table C.15 Informants' strategies for keeping belongings protected from flood waters.

Strategy	Excerpts
Raise belongings (elevate belongings above flood waters in home)	• "*No, bricks itself doesn't work. We can see the flow of water is very fast, we buy bamboos then also ropes then raise everything by two feet. We raise our belongings by 2 feet at first, then we stay that way for a few days, when we see that the water level is still rising then we raise it even more. If the water level doesn't reach that high we can lower the elevation and if water stops rising it's a good thing. When we see the water level is still rising we raise the belongings even more*." (PB1); • "*We raised the bed… and supported it with bamboo sticks. We raised the bed and supported it using bamboo sticks…*" (PB5); • *"…We took whatever we could, rest we put above the roof on a macha.*" (PB6); • "*Tidy everything up. Buy bamboos, ropes. Make machas, raise the house. Stay with my children…*" (PB6); • "*Oh yes. I had to raise everything using bricks and keep things on a macha* [2004]." (PB8); • "*We make platforms. We put everything on sacks and then pile it up on higher elevation. They stay safe there*." (PB8); • "*When our room was half filled with water we raised our belongings and lived on top of that…* [in 2004]" (PB9); • "*We raise the belongings using bricks*." (PB9); • "*Yes, I leave them* [fridge]. *I raise the bed and keep the fridge on top of that, so that it doesn't get spoiled by the water…*" (PB9); • "*Make machas. Put the belongings on top of that. We stay on the macha as long as we can. We try to cover ourselves with polyethene and live…*" (PB10).
Move belongings (move belongings to other dry location/s)	• "*We took it* [their belongings] *in that 3 story building during 1991 and on the streets during 88. We couldn't take everything. We took whatever we could…*" (PB6); • "*I will pack my belongings and keep them somewhere safe. If I don't fix things up from before I will suffer later. If I see any safe place around where I can…*" (PB9);
Pack belongings (away in sacks & containers to try to protect them from being spoiled by the water)	• *"…Some of the belongings we packed and put it inside sacks, the other things were left out in the water…*" (PB5); • "*I will pack my belongings and keep them somewhere safe. If I don't fix things up from before I will suffer later. If I see any safe place around where I can…*" (PB9);
Stay with belongings (in home)	• "*Raise the bed up higher with something, buy a lot of things from the market, husband stays in his office to do his duties, I send the kids to some other house where it is safer, my relatives house is on higher grounds I send them there and live alone at home.*" (PB4);

Strategy	Excerpts
	• "*I was at home. But the children and their father went to Khulna because they were too little and the water here was too dirty* [2004]" (PB8).
Prioritise belongings (depending of value of things to informants)	• "*Yes, I leave them* [fridge]. *I raise the bed and keep the fridge on top of that, so that it doesn't get spoiled by the water. Things that can get spoiled we keep them on the bed, but the Tables and other things they stay there. Only the valuable things are kept on higher grounds. The chairs and Tables stay in the water. How many can we save? Only the necessary things we can save…*" (PB9).

Loss of Electricity

In anticipation of the loss of electricity during floods, informants mentioned keeping candles and matches at the ready. Box C.7 lists some strategies informants mentioned as employing to be able to cope with no electricity. In addition to keeping candles and matches, informants mentioned making traditional mud stoves to cook (Figure C.19a) with, or using firewood to prepare food (Box C.7).

Box C.7 Informants' responses regarding strategies informants use to cope with no electricity.

- "*I keep candles and matches with me too…*" (PB1);
- "*I made mud stoves from beforehand*." (PB1);
- *"…we have to cook on a mud stove…*" (PB5);
- "*We had to raise the stove and cook with fire wood* [2004]" (PB8).

Figure C.19a (taken during the 2004 floods in Badda by representatives of Food For the Hungry) show the mud stoves made by the women. Figure C.19b shows a photo (taken during the 2004 floods in Badda by representatives of Food For the Hungry) of a woman in an evacuation shelter cooking with a mud stove.

(Photograph used with permission from Food For the Hungry)

Figure C.19a Photograph of mud stoves (2004 floods, Badda).

(Photograph used with permission from Food For the Hungry)

Figure C.19b Photograph of woman cooking with mud stove (2004 floods, Badda).

Clean Water

Not having access to clean water for washing, cleaning and drinking can have serious health and well-being impacts. Table C.16 lists some of the response strategies informants use to cope with lack of access to clean drinkable water. The five main strategies identified from informants' interviews included:

1. Getting water from the submerged tube well by extending pipes out of it;
2. Raising the tube well tap above the water level with a metal pipe;
3. Fetching water from people who have managed to adapt their tube wells, or other more distant sources;
4. Being given water from aid organisations; and
5. Using purification tablets to try to make the available water safer to drink.

Table C.16 Informants' responses regarding strategies informants use to cope with lack of access to clean drinkable water.

Strategy	Excerpts
Pipes extended out from tube well	**Use pipes to get water out of submerged tube well** - "*We pumped the water from the tube well and used pipes to bring it upward* [in 1998]" (PB3).
Raise tube well with metal pipe above water	**Raise their tube well before the floods arrive** (Figure C.20a) - "*I learnt how to fight the flood and what to do before the flood comes. To raise the tube well and to store food.*" (PB9).
Fetch water from other (more distant sources)	**Fetch water from people who have managed to raise their wells** - "*Where they have a tube well in higher elevation. Someone takes the water supply line on a higher elevation, where the flood water cannot reach. We have to get our water from those places*" (PB5).
Get water delivered by aid organisations	**Get water from aid organisation** (Figure C.21) - "*Some people would come by boat and give us some flat rice, puffed rice* [Dry food*]. I didn't get much flour, people used to give us something sweet. Also they supplied us pure water too…*" (PB7).

Strategy	Excerpts
Use purification tablets	**Use water purification tablets** - "*We went on field duty. To see how people are doing. Then we had a meeting to find out what can we give them. Like medicine, saline, water purification tablets, soap.*" (PB8).

Figure C.20a shows a photo (taken during the 2004 floods in Badda by representatives of Food For the Hungry) of children getting clean water from a tube well that has been raised above flood level, Figure C.20b shows a normal tube well that hasn't been raised.

(Photograph used with permission from Food For the Hungry)

Figure C.20a Photograph of children getting water from a tube well that has been raised above flood level (2004 floods, Badda).

(Source S. Birkholz personal observations)

Figure C.20b Photograph of normal (not raised) tube well (taken dry season 2012).

Figure C.21 (taken during the 2004 floods in Badda by representatives of Food For the Hungry) shows water being prepared to be delivered to people in need.

(Photograph used with permission from Food For the Hungry)

Figure C.21 Photograph of water being distributed by vangari to people in need of clean water (2004 floods, Badda).

Pests

As with most difficulties informants talked about experiencing during a flood, they also were able to describe strategies they utiliise to protect themselves from snakes and other pests. Some of these strategies are listed in Table C.17. Strategies included: using chemical deterrents; limiting areas where snakes could hide, being aware that there is help; or move away. One informant described using kerosene to keep the ants out of their beds at night - "*We couldn't sleep because of red ants… We had to put kerosene on bed and also beat the bed before we went to sleep*" (PB5).

Table C.17 Informants' responses regarding things they can use to protect themselves from snakes.

Strategy	Excerpts
Chemical ['medicinal'] repellants	"[What do you need to survive a flood?] …*To repel snakes… medicines to keep the snakes away.*" (PB1); *"…I kept insecticides to keep away snakes and ants…"* (PB5); "[How do you protect yourself against snakes?] *Snakes? We have medicines. When we use that snakes don't come near…* [can it be used in water?] *Yes, its powder. It has a smell that keeps the snake away.*" (PB6).
Keep us clean (do not create places snakes can hide)	"*We keep the house clean, so that the snakes cannot hide in the rubbish, we check everything…*" (PB4).
Awareness	"*No one knew* [reflection on 1988 flood*] that snake bites can be cured. We thought people die if they are bitten. But now there are medicines and doctors can heal people…*" (PB10).
Move away	"*In our house. So we couldn't live in this house. There were snakes outside of our house. Snakes used to come in our house. As there was water everywhere* [in 1998]" (PB2).

C.6.2 Financial

Money

Four ways in which informants suggested they get money during floods are shown in Table C.18. These include: selling property, borrowing money, managing what money they do have carefully, and/or saving up beforehand. By and large informants did not discuss how they make money during flood events. One informant mentioned that she tried to help her neighbours by giving money when she can - "*I prepare myself… I do as much I can to help… If they don't have money I try to help with money…*" (PB5).

Table C.18 Informants' strategies for getting money during floods.

Strategy	Excerpts
Sell property/belongings	"*So my mother sold 2 acres of our property. We got about 60000 taka and using that money we could complete our HSC exam and have food.*" (PB2).
Borrow money	"*We had to borrow money from people, because we didn't have work.* [2004]" (PB8).
Use money sparingly/carefully	"*We have to make use of the money that we have properly…*" (PB8).
Save up beforehand	"*We learnt from the struggles. We learnt how to save and prepare before the floods. Learnt to be patient…*" (PB10).

Work

Informants did not offer any information on any alternative strategies they utilise to find work and make an income during a flood. One strategy to enable one informant's husband to be able to work was to stay in his offices - "*Raise the bed up higher with something, buy a lot of things from the market, husband stays in his office to do his duties, I send the kids to some other house where it is safer, my relatives house is on higher grounds I send them there and live alone at home.*" (PB4). It was implied by another informant that those people who have a boat are able to earn an income - "[do you have other ways of making any income during a flood?] *No, we did not have any other ways, people who bought boats they had that chance, but not us…*" (PB7).

C.6.3 Travel

Boats, like bridges and platforms, are coping strategies utilised during floods that have hazards associated with them (Table 5.1, Table C.11). Boats enable informants to travel in the flooded streets without having to walk in the water. Box C.8 lists some of the excerpts from informants' interviews, which describe how boats are utilised during flood events. Refer back to Section C.5 to see photos of boats being used during the 2004 flood in Dhaka.

Box C.8 Uses of boats by informants.

- "*We go to people's houses on boats*." (PB1);
- "[How do you get your groceries?] *When the roads are flooded we have to use boats to travel.*" (PB3);
- "*We have to use the boats to take them to school*." (PB3);
- "*There were boats; we had to commute using boats*. " (PB4);
- "*Yes, we used a boat to travel on the main road…*" (PB5);
- "*I kept my cows like that during 1991s flood. I tied my cows up 3 stories high. I used to bring grass for the cows using a boat*." (PB6);
- "*In 1998 water level was very high. We lived on the roof of our house and so did many other families. People who had boats they slept on boats. Many people slept on roads by placing papers on the streets…*" (PB7);
- "[do you have other ways of making any income during a flood?] *No, we did not have any other ways, people who bought boats they had that chance, but not us…*" (PB7)
- "*The gas stove goes under water, you cannot boil the rice, sometimes people bring cooked rice with lentils using boats…*" (PB10);
- "*We don't have boats in Dhaka always, in the village we have boats available all the time. So when someone is sick we don't face that much difficulty to take them to a doctor*." (PB10)

C.6.4 Health

As is to be expected protecting their and their family's health is of importance to informants. Tables C.19 and C.20 list the ways informants described how they over come the impacts experienced relating to food availability and illness prevention.

Food

Informants strategies for getting and/or preparing food during floods (Table C.19) include:

- Storing dry food beforehand;
- Getting it from relief organisations during a flood;
- Sharing it with those in need;
- Changing the times and number of times a day informants cook;
- Making alternative dishes;
- Using traditional mud stoves and firewood to cook; and
- Raising the stove on to a platform or the roof to cook.

Table C.19 Informants' strategies for getting and preparing food during floods.

Strategy	Excerpts
Preparedness - storing dry food before flood	• "*…I would buy dry food by calculating the amount of days we can live off that food, some medicines, saline, or…"* (PB4); • *"…we take these steps: like, it will be flooding soon, we still don't have gas supply, we cook using wood as fuel. So we fix our mud-stove, buy extra firewood. So that we would have extra wood and we would be able to cook and eat. We also buy more quantity of rice as anything can happen during floods.*" (PB4); • *"…I kept some dry food, such as rice and lentils. If I couldn't go outside, even for a whole day I could still eat rice and lentils with my children. I made mud stoves from beforehand…*" (PB5); • "*Keep a lot of dry food with you, because at that time it's difficult to get a fire going to cook food. Keep biscuits, coagulated sugar, flat*

Strategy	Excerpts
	rice, puffed rice, etc." (PB7); • "*I learnt how to fight the flood and what to do before the flood comes...To raise the tube-well and to store food*." (PB8); • "*Yes, food and other things, we have to prepare from beforehand. It is difficult for us to cook, so we keep dry foods around all the time. We bring puffed and flat rice, refined sugar from the shops. We keep those with us…*" (PB9); • "*Dry food is what you have to keep with you, because there is no way to cook at that time. If you have dry food at that time you will struggle less…*" (PB9).
Get it from relief organisations	• "*Some people would come by boat and give us some flat rice, puffed rice* [Dry food*]. I didn't get much flour, people used to give us something sweet. Also they supplied us pure water too. It was our neighbours and also unknown people. People came from Gulshan or Rampura, more People came from the NGOs*" (PB7);
Share with those who do not have	• "*I prepare myself… I do as much I can to help. If they don't have food when I cook I give them something…*" (PB5).
Cooking & preparing food -strategies to make it go further	• "*We cooked once a day and we had that three times*. [2004]" (PB8); • "*We starved. We couldn't make bread with flour, because it won't be enough for all of us. So we used to make a thick gravy with flour and then had it. The stove was under water. We didn't have any fire wood. It was very difficult to cook…[*1988]" (PB10).
Cooking & Preparing - strategies for cooking [overcoming difficulties with stoves]	• "*I made mud stoves from beforehand*." (PB1); • *"…water level was up till this point of our house, It was really hard for us to cook and eat...we made a macha inside the house, put the stove on the macha. I had to keep my children on the roof.*" (PB3); • *"…So we have to cook on a mud stove*." (PB5); • "*We had an electric stove. When I got up in the morning, I used to turn that stove on and cook something then for the rest of the day I did not use it. I again used it during the evening…*" (PB7); • "*We found it difficult to cook, our stove went under water. We had to raise the stove and cook with fire wood* [2004]" (PB8).

Health

All informants were aware that they needed to store up basic medicines, saline, water purification tablets and snake repellants beforehand, so that they could better help keep their family healthy - "*All time we have some medicine in our home.*" (PB2). However, financial limitations, or all their supplies running out because of the duration and extent of event, often meant that informants didn't have a ready supply of medicine and saline available to help fight off illness. In these cases informants mentioned being able to make their own remedies for skin ailments from what they did have at hand (e.g. turmeric, chilli and salt) (Table C.20). Similarly informants described how they would make their own saline using sugar and salt, to help keep them hydrated when afflicted with diarrhoea (Table C.20).

Asking for help from local relief organisations was also a strategy identified from informants' interviews as a means of getting medicines and saline during a flood (Table C.20). The last strategy identified involved the preventative actions or lessons informants employed or taught their children to reduce the chances of getting sick through exposure to flood water or associated hazards - "*My*

parents used to tell us when the water level was high, do not go in the water, do not eat street foods, they did not allow us to go out much, if we went outside they escorted us, helped us walk properly using the shakos [bamboo bridges]. *We do the same things. We take them* [their children] *to school, bring them back safely, we make them have good food, we keep tablets and water at home. Because we never know what might happen…*" (PB7) (Table C.20).

Table C.20 Informants' strategies for preventing or dealing with illness during floods.

Strategy	Excerpts
Preparedness - store medicines	• "*In the rainy season diarrhoea is a problem. So we get ORS saline and rice saline. Chira* [Flat rice], *banana*." (PB2); • "*I would fix up any of the small holes or any other issues that can cause problems in our house, try to harness the roof and make it sturdy. I would buy dry food by calculating the amount of days we can live off that food, some medicines, saline, or…*" (PB4); • *"…to keep saline nearby, keep matches and all the essentials things in a safe place so that they don't get spoiled*." (PB5); • "*Keep saline at home. Keep ointments for boils and infections*." (PB6); • "*Keep a lot of dry food with you, because at that time it's difficult to get a fire going to cook food. Keep biscuits, coagulated sugar, flat rice, puffed rice, etc. Keep drinking water, saline. Tablets for diarrhoea, the children can suffer from diarrhoea. Make the children wear light clothes, because it's harder to dry heavy clothes when they get wet and because you don't have enough space either, wear light, half sleeved/ sleeveless clothes…*" (PB7).
Local remedies	• "*We didn't have much money. When we didn't have saline at home and it was at night, the shops were closed. So we had to make saline using one fistful of sugar, one pinch of salt and half a litre of water…*" ("PB6); • "*Eat dry foods. We don't get bread and bananas at that time. If we can't get saline from the stores we make saline using sugar and salt. I make the children eat rice with water, so that he can stay healthy…*" (PB10); • "*My daughter used to go to work walking through that water which was at her chest level. She had boils all over her body. We had no medicine, so I made a paste using turmeric, chilli, salt and heat is up. Applied that on the boils the child went through a lot of pain…* " (PB10).
Get medical help	• "*Then I spoke to Mizan* [FH representative] *and the others stood in the roads somewhere. I told him what supplies we needed. I told him everyone gets rice somehow because it's the basic need to survive. But they wouldn't buy soaps, water purification tablets, creams for boils and sore feet, to repel snakes - snake medicines. When he asked what supplies he could provide I told him about these things.*" (PB1); • "*Sister Hosneara gave us medicines, tablets, pure water etc…*" (PB7).
Preventative actions & lessons	• "*My parents used to tell us when the water level was high, that do not go in the water, do not eat street foods, they did not allow us to go out much, if we went outside they escorted us, helped us walk properly using the shakos [bamboo bridges]. We do the same things. We take them* [their children] *to school, bring them back safely, we make them have good food, we keep tablets and water at home. Because we never know what might happen…*" (PB7).

C.6.5 Family

In terms of family, informants were most concerned about protecting their children during floods. Box C.9 presents some excerpts describing how informants try to protect their children.

Box C.9 Informants' strategies regarding how they protect their children during floods.

- "*I used to tie them* [their children] *with a string on a bamboo. Otherwise they might fall and even die*." (PB1);
- "*Raise the bed up higher with something, buy a lot of things from the market, husband stays in his office to do his duties, I send the kids to some other house where it is safer, my relatives house is on higher grounds I send them there and live alone at home*." (PB4);
- "*We carried the children on our shoulders to their school. We got wet ourselves but we didn't let our children get wet*." (PB6);
- "*My daughter was so little so I was afraid that she might fall and get hurt. Accidents can happen. So me and my in laws, everyone went to the village*." (PB8);
- "*I used to tie my son up. He was 6 months and there was a risk of him falling the water. I used to make him sit in the middle of people who surrounded him. He fell twice before. So I was cautious*. " (PB10).

Appendix D: Chapters 6 & 7

D.1 Protection Motivation

D.1.1 Wilhelmsburg, Hamburg

Table D.1 Summary of findings in Wilhelmsburg: Context

Variables & Processes	Description	Implications for Protection Motivation
Context	• An island in an Estuary; • Fluvial flooding - from storm surges from the North Sea. • Historical culture of flooding ('amphibious societies'; 'disaster cultures' - Kempe, 2007); • Last major flood in 1962; • Dependent on structural flood defence; • Disaster Culture disappearing; • Hamburg growing from international immigrants into the city; • Planned & controlled urban growth & redevelopment of the island; • City authorities working at changing the image of the island and promote it as a place to live and invest in; • Hazard-based culture related to people and social situation not flooding; • Diverse range of organisations and institutions working at trying to promote social resilience on the island (e.g. research teams, the Deichwacht and Deichverband).	• Reduced appreciation of the implications of the flood risk the island faces; • Increases in the potential damage on the island as infrastructure and buildings are redeveloped and expanded, and the number of people living on the island increase; • Image [reputation] of the island represents a more direct concern than flooding; • Cultural capital of island inhabitants does not involve a relationship between them and the dikes or the risk of flooding.

Table D.2 Summary of findings in Wilhelmsburg: Sources of Information

Variables & Processes	Description	Implications for Protection Motivation
Intrapersonal variables	• Interested Germans; • 50:50 gender ratio; • Four community groups identified (New Wilhelmsburgers, Old Wilhelmsburgers, Students & Immigrants) with interactions between them restricted to general every-day associations and passing by.	• Having some interest in the topic indicates some awareness of the threat, if not preparedness needs. • Social capital of informants dispersed beyond Wilhelmsburg.
Prior experience	• The amount of direct flood experience present in the communities of Wilhelmsburg is decreasing with time & with old Wilhelmsburgers moving away or dying of old age.	• Direct, personal and specific information concerning the impacts of a flood on the island & coping options disappearing.

Variables & Processes	**Description**	**Implications for Protection Motivation**
Environmental sources: <u>Verbal Persuasion sources:</u> *Community interaction*	• Conversations concerning the topic of flooding of the island restricted & limited. • Old Wilhelmsburgers represent the chief source of information about the 1962 flood. • 'The neighbour' appears to be both a source of information to New Wilhelmsburgers. • The approaching 50th anniversary has increased flood centred conversations. • Transmission of information from [school] children to adults not evident to all but one informant.	• Not a topic of interest. • Awareness of the risk diminished (especially in new residents). • Perception & attitude of there being no need to worry. • Lack of personal (trusted, e.g. family & close friends) sources of community interaction concerning floods. • The source of valued, grounded & respected information disappearing (Old Wilhelmsburgers). • 'The neighbour' is not a close acquaintance, interaction is restricted, however there is a belief that they would help, and the informants would help them. • Restricted dissemination of risk message to children.

Organisational interaction	• Both authorities & organisations distributing risk messages through a diverse range of mechanisms.
	• Belief in information being available about the flood situation is high, but very few have sought it out.
	• Informants described incidents where the authorities appeared not to be concerned with protecting infrastructure behind the dikes.
	• Internet seen as main source of information prior to an emergency, radio important source during an emergency.
	• Media messages satisfying interest level of informants without creating any sense of urgency or need to take precautions.
		• Message being received is that the authorities have flood defence under control.
		• Less evident message of need for personal preparedness being perceived.
		• Potential for some of the risk messages being published in German & therefore not accessible to aspects of immigrant communities (i.e. Muslim & middle-eastern women) on the island.
		• Little perceived need to inform oneself
		  o not interested.
		• Internet enables people to put of having to get information before anything really is happening
		  o no sense of urgency.
		• Having the Internet available empowers informants & establishes a level of comfort and self-efficacy without having to do anything.
		• Climate change and the dredging of the Elbe pose future threats.

<u>Observational learning sources</u> *Environmental clues*	• Dikes are a visible part of the landscape on the island. • Bus stop gathering & pick up points during an evacuation. • Awareness of island situation & storm surge dynamics outside of the dikes. • No other flood since 1962.	• Provide informants with evidence of the defence strategies the authorities have put in place to protect. • Sources of learning that involve going to the river, especially during a storm surge event are experiential & provide more

Variables & Processes	Description	Implications for Protection Motivation
	• Weather signs/warnings.	personal awareness of the situation beyond the dikes (not usually seen from the perspectives of the island inhabitants living behind the dikes). • Absence of another flood events (big or small) reinforce people's trust in authorities actions & sense of safety (reducing any sense of need to take precautions). • Maintain some level of awareness of the threat.
Memoria	• 1962 flood marks positioned at different parts of Reiherstiegviertel show height the flood waters came to. • Flood marks small, difficult to find & easily overlooked.	• Flood marks act in reminding or informing people that there was a flood, & how high it came (& the associated implications of that to them & their belongings). • Memoria may not be having much affect on the risk perceptions of residents.
Indirect Experience	• Informants utilise experience with other emergency events to invasion what may happen during a flood event. • Interactions with neighbours, family or friends who have direct flood experience (specifically experience with the 1962 flood). • Calls to evacuate in times of high storm surges (restricted to the more vulnerable, low-lying areas of the island e.g. Moorwerder).	• Boosts awareness of the conditions experienced during the 1962 flood. • Acts as a point of comparison of the likelihood of events being repeated. • Establishes confidence in the preparedness measures put in place by the City. • Provides indication of the action of neighbours in terms of providing help in times of trouble. • People making threat appraisals (& coping appraisals) based on events that may have very little in common with a flood event or situation.

Table D.3 Summary of findings in Wilhelmsburg: Outcomes of Sources of Information

Variables & Processes	Description	Implications for Protection Motivation
Historical Awareness	• Historical awareness predominated by 1962 flood. • Newer informants to the island indicating lack of awareness. • Historical awareness linked to three identifiable semantic relationships: 'results from' (causes), 'involved in' (who), 'knowledge of' (don't know), and 'resulted in' (implications). • Information concerning the implications (resulted in) the 62 flood was most accessible to	• Historical awareness to new residents broad, impersonal & indirect. • Old Wilhelmsburgers' historical awareness personal and specific. • A lack of admitted awareness concerning the flood history of the island among newer residents. • Awareness of the potential implications & severity of a future flood from knowledge of old impacts.

Variables & Processes	Description	Implications for Protection Motivation
	informants.	• Awareness that the dikes have been improved since, & withstood bigger storm surges. • Awareness of why the flood happened, & belief that they are better prepared & protected now.
Reliance on public protection	• Both the dikes & 'the City' of Hamburg represent a significant source of safety to informants. • Informants indicate a high degree of trust in both the dikes & 'the City' to protect them from any future floods.	• Informants have interpreted the sources of information about future flood risk to Wilhelmsburg to suggest that the City and the plans they have made are sufficient protection. • Informants indicated a high level of trust that the dikes can continue to be adapted to protect them. • High reliance on the City & the dikes.

Table D.4 Summary of findings in Wilhelmsburg: Cognitive processes

Variables & Processes	Description	Implications for Protection Motivation
Threat Appraisal	• Threat probability being estimated by the degree to which uncertainty surrounds either informants' sources of safety or sources of concern. • In general informants carry a high confidence in their sources of safety and belief in their being no flood threat to Wilhelmsburg. • This is because flooding is either not a threat 'at the moment', or is not a threat because of the dikes. • Informants' threat appraisal is low, they do not in general perceive flooding as a threat, and due to their reliance on the dikes, and lack of emotional connection to the topic perceive any need to prepare. • Recognition that if it flooded again it could be severe is based primarily on their historical awareness & receipt of media messages. • Hold very little fear or concern about it happening & feel safe. • Risk associated with those things that could limit protection measures effectiveness e.g. dredging of the Elbe, climate change, sea-level rise, poor maintenance of dikes is a concern.	• Threat appraisal is dynamic & will shift as information either influences their certainty in sources of safety or uncertainty by promoting their sources of concern. • Currently [at time of interviews] their is a high level of certainty & belief in informants' source of safety & therefore, in the belief that flooding does not pose a flood risk. • Motivational energy being generated is low, it extends as far as informants believing they should prepare or at least the City should be prepared, but offers little in terms of emotional (fear) impact or experiential knowledge.
Coping Appraisal	• Very little coping appraisal has been undertaken by informants in Wilhelmsburg.	• It is not likely that informants' coping appraisal is directing motivational energy into protection

Variables & Processes	Description	Implications for Protection Motivation
	• Most informants demonstrated a high sense of self-efficacy through their belief that they would be able to cope if a flood did occur. • Although belief in there being options is there, aspects such as high costs or lack of availability as in the case for flood insurance is reducing informants' coping appraisal.	motivation. • That energy created through what threat appraisal is generating motivational energy is leading informants to think that perhaps coping needs to be thought about is being absorbed by non-protective responses, & informants sense of self-efficacy.

Table D.5 Summary of findings in Wilhelmsburg: Coping

Variables & Processes	Description	Implications for Protection Motivation
Protective responses	• Know where Sturmflut pamphlet is if not prepared. • Have an emergency plan & rations (only one informant). • Know where emergency documents are.	
Non-protective responses	• Informants use non-protective responses to deal with any discomfort their awareness of flood threat generates. • Cognitive, emotive and situational strategies.	• Non-protective responses are being stimulated by informants' threat appraisal to deal with any discomfort their perceptions are creating. • Non-protective responses are also the result of what little coping appraisal is happening.

D.2 Badda, Dhaka

Table D.6 Summary of findings in Badda: Context

Variables & Processes	Description	Implications for Protection Motivation

Context	• Rapid rate of urbanisation (in last decade).
	• Large rural-urban migrant population growth.
	• Large urban poor population.
	• Uncontrolled urban development:
	  o Large informal settlements;
	  o Encroachment of drainage system;
	• Dhaka is the administrative, financial, research & industrial centre of Bangladesh.
	• New 'democratic' leadership, split on issues of collective identity.
	• City characterised by:
	  o extreme inequality;
	  o housing is a problem;
	  o the provision of services & infrastructure like: electricity,
		• Urban poor communities exposed to the impacts of floods.
		• Likely to have a high protection motivation, as floods are an active reality in lives.
		• Local flood defence structures limited in their ability to protect & provide aid.
		• High need to be organising personal preparedness.

Variables & Processes	Description	Implications for Protection Motivation
	gas and fuel supply, water supply, sewage and sanitation, & waste management, are sketchy and unreliable; o Weak provision of education, health care & recreation (unavailable to urban poor); o Traffic congestion; o High levels of air & noise pollution. • High crime rate, little trust in police & law enforcement agencies by urban poor. • Risk substitution resulting from GDFPP, water logging behind embankments due to poor drainage. • Annual flood events. • Major floods every five to ten years (1988, 1998, 2004, 2007). • Use of structural defences to try to limit flood extent. • Use of non-structural defences to try to limit the impacts of floods.	

Table D.7 Summary of findings in Badda: Sources of Information

Variables & Processes	Description	Implications for Protection Motivation
Intrapersonal variables	• Urban poor. • Muslim women. • Collective culture.	• Chiefly responsible for implementing coping strategies to protect home & children. • Vulnerable to the impacts of floods, & domestic violence.
Prior experience	• Direct personal experience with flooding; • Informants' experiences have played an intricate part in forming how informants perceive the risks associated with flooding, and the adaptations to their lives they have adopted to help cope with and manage flood events. • Their experience provides informants with first hand input and understanding around what happens during floods, and how their own lives are affected, as well as how they are able to handle flood events.	• Informants' awareness of the risks not only generates motivational energy, but triggers coping appraisal processes that direct this motivational energy into protection motivation. • Protection motivation results in the utilisation of a series or diversity of adapted coping responses.
Environmental sources: Verbal Persuasion sources: *Community*	• Represent an important part of informants' sources of information. • Close relationships with neighbours & community gives confidence that necessary risk	• Confidence in their awareness of flood risks & responses. • Awareness around flood risks culturally (passed on from mother to child) entrenched. • Information current & often carries

Variables & Processes	Description	Implications for Protection Motivation
interaction	information will reach them. • Informants saw themselves as a source of community interaction & information. • Knowledge learnt from mothers growing up. • Trusted & relied on sources.	a trusted urgency. • Information itself is part of the coping strategies informants have to cope with floods.
Organisational interaction	• Little to no interaction with government agencies. • Interaction with NGOs concern the receipt of relief during an event, & to a lessor degree information on how better to prepare. • Lessons taught to school children.	• Limited interaction. • Interaction with NGOs, can increase protection motivation through teaching informants how to cope & prepare.
Media Messages	• Provide warnings & updates.	• Trigger coping appraisal & different action/s relative to time into & nature of event.
Observational learning sources *Environmental clues*	• Part of informants' coping & management strategies. • Watch the weather, the water, & local animal behaviour to tell them when to start acting, & how to prepare themselves to brace the impacts.	• Culturally incorporated. • Socio-ecological relationship. • Can generate fear. • Triggers coping appraisal, protection motivation & responses.
Memoria	• No real memoria. • Cultural meaning attached to local structures & elements associated with flooding. • Elements of flood defence & coping accessible, have alternate functions outside of flood season.	• Form part of informants' lives. • Remind informants of risk & situation. • Active threat appraisal.

Table D.8 Summary of findings in Badda: Outcomes of Sources of Information

Variables & Processes	Description	Implications for Protection Motivation
Historical Awareness	• Historical awareness product of life-lived & cultural norms. • Direct, personal, specific awareness of historical flood events. • Used to appraise & describe their situations throughout their interviews. • Able to identify a bad floods characteristics from a 'normal' event.	• Same as prior experience. • Forms part of informants' assessments of threat severity, acts in generating fear.
Reliance on public protection	• Little to no reliance on the GOB for aid & protection. • Awareness of their own responsibility in protecting	• Motivational energy will be funnelled directly into protection motivation & coping responses, as their is no one else that will protect

Variables & Processes	Description	Implications for Protection Motivation
	themselves.	them.

Table D.9 Summary of findings in Badda: Cognitive processes

Variables & Processes	Description	Implications for Protection Motivation
Threat Appraisal	• Informants are afraid of floods. • There is a high awareness of the severity of them, & their destructive natures. • They perceive the risk that they a likely to occur again, but hope that they won't. • This hope doesn't stop them from being prepared to act is they must.	• High threat appraisal, degree of strength may fluctuating with factors such as time between major events, nature of annual events, changes in their environment they perceive as sources of safety. • Informants have a high level of motivation energy & 'strength'.
Coping Appraisal	• Informants innately recognise that their perceptions towards coping with floods revolve around the statement and resolve 'I have to cope'. • Their assessment of their ability to cope is related to several actions: fighting, persevering, giving help, getting help, knowing, learning, leaving, staying. • These coping abilities are seen in respect to physical influences & more personal sources of strength.	• Motivational energy is directed into protection motivation & protective responses.

Table D.10 Summary of findings in Badda: Coping

Variables & Processes	Description	Implications for Protection Motivation
Protective responses	• Established coping strategies for preparing, fighting, protecting against identified impacts related to flooding.	• Is present & engaged in adaptive coping responses annually.
Non-protective responses	• Elements of 'wishful thinking' attached to 'uncertainty' and 'changing' elements of threat appraisal. • Uncertainty perceived by informants, also enables them to believe that it may not happen again and gives room to their faith to play a role in their protection.	• No real implications for protection motivation. • May reduce it if the time between major flood events is 'too' long (i.e. People begin to believe they are safe).

D.3 Reflections on Protection Motivation

Potential Damage	PM Levels		Adaptive Behaviour				Actual Damage
			Awareness	Emergency Planning	Coping strategies	Structural defences	
High	1	None-low PM non-repetitive inactive	None-low No Personal awareness efforts.	None-low No Personal emergency planning. No perceived need to evacuate.	None-low Valuable assets not planned for. No Livelihood strategies. No Health strategies. No developed coping strategies.	None-low No structural adaptations.	High
	2	Low PM	Passive Single action, non-repetitive Personal awareness efforts	Passive Priority items planned for (e.g. Personal papers).. No perceived need to evacuate.	Passive Some Valuable assets planned for. No Livelihood strategies. No Health strategies. Some developed coping strategies.	None-low No structural adaptations.	High- reduced
	3	Medium PM	Passive-Active Single-to-multiple action, non-repetitive Personal awareness efforts	Passive-active Personal papers planned for. Some perceived need to evacuate. Time taken to think about what is needed - parts of emergency kit put together.	Passive-active Valuable assets planned for. No Livelihood strategies. Some Health strategies. Some developed coping strategies.	Passive Structural adaptations Investigated. Temporary defences may have been Investigated - e.g. sandbags.	Reduced
	4	Medium-high PM	Active-Passive multiple action, repetitive, Personal awareness efforts	Active-Passive Personal papers planned for. Perceived need to evacuate & willingness. Time taken to think about what is needed - emergency kit put together.	Active-Passive Valuable assets planned for. Some Livelihood strategies. Some Health strategies. Several developed coping strategies.	Passive-active Structural adaptations Investigated, some implementation (depending of costs). Temporary defences may have been Investigated - e.g. sandbags.	Reduced- low
	5	High PM	Active multiple action, repetitive, Personal awareness efforts.	Active Personal emergency plan & kit in place. Emergency supplies actively checked. Perceived need to evacuate & willingness to do so.	Active Valuable assets planned for. Some Livelihood strategies. Several Health strategies. Several developed coping strategies - flood culture.	Active-Passive Structural adaptations Investigated, some implementation (depending of costs). Temporary defences may have been Investigated & prepared for - e.g. sandbags.	Low

Figure D.1 Proposed descriptors of coping response relative to different levels of protection motivation, and indication of possible shifts in actual damage due to action taken. Actual damage is considered relative to a 'manageable' flood event, extreme events are seen to surpass personal coping abilities. Potential damage considered to be high relative to flood event.

D.4 Mitigation recommendation in the cases

In both cases mitigation cannot be easily achieved. As with a lot of the other variables discussed the two cases present polar opposite examples, on the one hand Wilhelmsburg informants are over reliant and confident in their government structures to protect them, and on the other hand Badda informants do not have the option to rely in their government structures to protect them. However, the politics, economics, beliefs, culture, traditions, power structures, social dynamics, and religion behind the establishment of the two situations makes identifying ways to enhance social resilience, which requires a degree of acceptance of personal responsibility and contemplation, complex and contentious.

D.4.1 Mitigation Considerations in Wilhelmsburg, Hamburg

The lack of direct experience in Wilhelmsburg is problematic, but also a difficult issue to mitigate against. Simulations designed to expose people to certain conditions and events that are likely to take place during a flood are valuable ways of exposing people to the realities of flooding, however, again are largely limited to volunteers and people who are interested in the topic.

In Wilhelmsburg, there is a need to develop awareness programs that reconnect residents to the reality of their island lifestyle, in the sense that they need to be on a regular basis reminded that their property, family and themselves are surrounded by a river system, that is tidal and at the mercy of the wind and rain both upstream and downstream. Residents need to be exposed to events, situations, and media that highlights that there is a flood risk to Wilhelmsburg, and should the dikes break in several places, the severity of impacts in low-lying areas could be considerable. Of course such awareness initiatives carry the burden of bringing this message home, without generating wide-spread fear. They must work in such a dynamic fashion, that the message is presented continuously and not lost or neglected due to boredom and disinterest generated by time and the lack of perceived need or substance to the message. A key point to start is in the schools. Teaching the children living on the island, what the situation is from a young age, coupled with protective mechanisms they should implement or carry out in the event of a flood, means that generations of residents are being installed with an appreciation of the potential danger, but also knowledge of what needs to be done. Children also act as messengers to their families and parents, hopefully being able to help them know what to do in the event of a flood as well. Lastly in the immigrant families where several members may not speak German, the children act as translators and are not only able to let their families know of the danger, but also able to translate emergency messages as they are broadcast (via radio, tv, or loudspeaker) during events. Potentially working together to develop an awareness program that:

1. Generates awareness of the flood risk and its potential severity amongst residents by:
    a. Reconnecting residents to the reality of the river and its ‘moods’,

   b. Building interest in the community to understanding that the problem does affect them;
   c. Teaching children about of the risk at school;
   d. Being dynamic and keeping the message alive and relevant in the community over time.
2. Create clear strategies and means by which residents can affordably protect themselves and their property.
3. Provide avenues whereby residents can improve their awareness and understanding of events through a centre where they can experience the events of a flood, within simulated conditions. Especially exposing children to this simulations, within a safe environment in which they can learn to respond without fear.
4. Get residents involved in some aspects of the monitoring of the river, and the management of the dikes.

In Wilhelmsburg, city authorities could develop a program that highlights and reveals some of their own limitation and difficulties in protecting the island. A program that in showing some of the authorities' weaknesses appeals to residents to take responsibility where they can - be it only reading and investigation of the situation and emergency plans. In addition, the city or representatives of the city involved in development programs on the island need to take care not to present contradictions to their flood-risk messages. Suggesting that their own renovations or new developments do not need to be structurally designed to resist flooding, presents a situation in which residents are first confused and then doubting the extent of actual risk, therefore, are less likely to act to prepare themselves.

Apart from maybe reading the emergency pamphlets circulated by the city, most informants in Wilhelmsburg do not perceive the need to undertake steps to minimise any damage that may occur to their property because of flooding. Where there is some perception of need, it is overshadowed by the financial costs associated with implementing preparedness measures, which for the most part they do not perceive to be that necessary. However, people do believe that if a flood does come, they would be able to protect themselves and their family from harm. Within the flood awareness messages and initiatives being delivered in Wilhelmsburg there is a strong need to include clear directions and strategies that residents can easier recall and undertake in the event of a flood. The emergency pamphlet does include quite extensive information on the situation and what people need to be doing or cannot be doing (i.e. drive off the island) during a flood. Unfortunately, a general lack of perceived importance, generated through a lack of perceived threat, means that many people do not look at, let alone read, the pamphlet. Distributing this information through local social networks (e.g. social workers), schools, and local community venues (e.g. Buergerhaus and local churches and other religious venues), on a regular basis would help ensure that more get the information, in a form that they can be better understand (facilitate for different learning styles kinaesthetic, audible, visual, written etc). Developing ways in which the message is being broadcast through these social passages would also carry extra clout as residents will be receiving the same message from different sources several of which they have

pre-existing trust relationships with and, therefore, be more ready to accept and acquire the information.

The non-protective responses of the Wilhelmsburg informants do not promote the motivation to take protective responses. The lack of these protective responses means that they and their belongings are more vulnerable to impact and damage during a flood. But more than this, the residents themselves are vulnerable to high degree of shock in the event of a flood, because they have not cognitively & emotively been encouraged to think about the full impacts to them should a flood occur. Psychological trauma associated with shock, cognitive dissonance and false perceptions, can take years to deal with, and in the short-term (one to five years longer depending on person and event) reduce the person's capacity to undertake normal functions in daily life (e.g. concentrate for long periods of time, relate to others, deal with stress etc.), this may jeopardise their ability to earn a living. Therefore, mitigation measures that help residents identify their non-protective responses and help shift their risk perceptions (threat appraisal) to move towards adopting more protective responses (e.g. reading the emergency pamphlet and understanding what not to do during a flood event, having important papers in a protected place, moving belongings to higher elevations, developing their own emergency plans for their family, having an emergency supply of food, water, candles, dry clothes, and radio prepared). Protective responses do not have to involve costly structural defences for homes.

D.4.2 Mitigation Considerations in Badda, Dhaka City

In Badda, informants do not have to be made aware of the situation and likely outcomes as they have an in-depth and personal understanding of flood events and their impacts on their and their community's lives. They do however, have a need for training and resources that enable them to better prepare.

Listening to what the people have to say about what they experience, and how they overcome the difficulties and impacts they face from flooding, makes it clear how instrumental experience is in creating resilient communities. These people live with circumstances that expose them to floods. They have little options but to rely on themselves and their own ingenuity to survive, and their knowledge of flooding gained through personal experience and community interactions has equipped them with both the attitude and the ability to withstand most flood situations. However, the size and nature of a flood event can greatly limit these and force people to seek help and shelter elsewhere. Community-based initiatives that have aimed at capacitating people to improve personal circumstances (e.g. livelihood, involvement in local initiatives, connections with organisations and community members, gain authority and respect in local communities) have been rare amongst the urban-poor in Dhaka City. However, the work the informants of this study had done with Food for the Hungry in developing a local-community organisation has clearly empowered many of these women in the way they think about and prepare for floods. As such it is recommended that additional programs amongst urban-poor communities would be beneficial in improving the vulnerability of these

communities. It's important to point out that Food for the Hungry's local community based initiative in Badda had long-term, holistic goals. As such, this organisation was able to build up trust relationships with the participants, and provide a broader focus for the improvement of their lives in general. In addition, it had a clear exit strategy and goal from the start. This meant that, although trust was developed between the NGO and community members, the members knew that they would have to handle and manage the results themselves. This has given participating members a greater sense of personal worth, community respect and independent confidence in being able to cope with the situations and threats common to their lives.

A point of concern is the reported corruption that prevents provided aid from reaching those in need. The answer to this may lie in better policing and accountability of how foreign aid (at least) gets distributed and used. Of course the difficulty lies in the fact that when aid is being provided the situation is probably in the extreme, and knowing where aid is most needed difficult to determine. In situations like this, a network of monitors from various areas in the city, locals trained to investigate and report back on the situation in their zone, can ensure that information about needs and issues gets back to relief organisation swiftly and timely. Again, in this regard Food for the Hungry's local community based initiative in Badda seems to have been helpful in the 2004 flood.

Informants in Badda take pride in their ability to cope, and the character that develops. As flooding is a part of life for them, much of the coping strategies are innately incorporated into their culture and daily patterns. For these informants, mitigation measures would be those that support their 'ability' to continue to cope throughout a flood event. Aspects such as:

4. Being in a position to help through involvement in local organisations and aid groups;
5. Being assured of help from aid organisations and other agents.
6. The opportunity to learn how to better prepare for flooding, in terms of financial planning and saving, and storage of foods.
7. Strategies for keeping illness away or remedies that they can put together themselves when they can't afford or get to medical help.
8. Assured water supplies, and secured allocation of daily food aid.
9. Affordable structural adaptations they can utilise to protect their homes and belongings (e.g. the idea of float houses) would enable them to save more of their property.

Although Badda informants demonstrate an extensive range of protective responses, it is important to remember that the nature (e.g. depth, durations, time of year, time after last event, water quality, etc.) of the event itself can quickly overcome their coping strategies. This leaves informants having to deal with financial, personal, psychological, physiological, emotional and physical repercussions. As mentioned above, when events stand to surpass the mechanisms that people have to protect themselves, then systems need to be in place to provide additional support or route to escape. Timely warnings (if possible), evacuation shelters, food and water aid, and ready medical aid can

help. From the Badda case five questions have been identified from this study that aid and relief organisations can consider in enabling women from urban-poor communities to better withstand floods:

1. What coping strategies are people using to prepare and cope with floods?
2. How can their own strategies be enhanced to better enable them to cope, with less damage and impact from floods?
3. What new strategies can these people learn that will better equip them to cope?
4. How best can aid be distributed and be kept clear from local corruption and politics/traditions?

What can be done to diminish trauma related to the conditions in evacuation shelters?